

MONOGRAPH OF THE GENUS *ALCADIA* IN CUBA (MOLLUSCA: PROSOBRANCHIA: HELICINIDAE)

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one new subspecies introduced. All nominal taxa hitherto proposed on the generic and infrageneric levels were investigated. Fifteen species, two polytypic, are recognized in five distinct subgenera. The zoogeographic distribution of *Alcadia* is contrasted with other Cuban heliciniids; *Alcadia* is thought to have invaded Cuba largely by fortuitous transport from Jamaica.

INTRODUCTION

The terrestrial prosobranch family Heliciniidae is distributed in two widely separated areas of the world. In the western hemisphere, the family is largely subtropical and richly developed in the Caribbean region. The Philippine Islands and adjacent areas in the eastern hemisphere form the other major concentration of the family. In the Caribbean, the Antillean islands have a highly diversified heliciniid fauna, and Cuba, the largest of the Greater Antilles, has an especially rich elaboration of forms with no fewer than four endemic genera.

This paper is the fifth in a series on the Heliciniidae of Cuba. Previous studies were devoted to analyses of the highly localized genera *Viana* (Clench and Jacobson, 1968) and *Priotrochatella* (Clench and Jacobson, 1970) as well as the more complex and more widely distributed taxa, the vianine genera, *Ustronia*, *Troschelviana*, *Calidviana*, and *Semitrochatella* (Clench and Jacobson, 1971b) and the endemic helicinine groups, *Emoda* and *Glyptemoda* (Clench and Jacobson, 1971a).

The present study deals with the genus *Alcadia*, a neotropical group occurring on

ABSTRACT. In this paper, the fifth in a series on the land snails of the prosobranch family Heliciniidae in Cuba, the systematics of the genus *Alcadia* is considered, with one new subgenus and

most of the islands in the West Indies as well as on the mainland from southern Mexico to northern South America. Both Jamaica and Cuba support a considerable number of species of the genus, but representatives are also found in Puerto Rico, Hispaniola, and most of the Lesser Antilles south to Trinidad.

This series of papers has, of necessity, been devoted largely to *alpha* taxonomy. No critical revisions of the Cuban helicininids have appeared previously and solution of considerable nomenclatorial problems is basic. Much of the earlier work in Cuba consisted of the description of new species from localized collections, while monographic works, in which the fauna of the entire island was considered, were virtually nonexistent. Recognizing a species' variations and noting the extent of its distribution have proven valuable in attempting to analyse the Cuban helicininid fauna. The number of nominal taxa has been greatly reduced. For example, *Emoda*, of which nearly 30 forms had been described, now consists of 13 species, three of which are polytypic.

The complexities of the taxonomy on a generic level reflect in large part our current ignorance concerning the interrelationship of the various recognizable species-groups of helicininid land snails. Certainly, generic and subgeneric limitations are subject to change in the future as more species are investigated and more information is accumulated on the features that are presently utilized as taxobases. We have been hampered in the lack of properly preserved materials. And the exact value of the structure of the radula in defining generic-level taxa remains to be carefully examined.

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ABBREVIATIONS

ANSP—Academy of Natural Sciences, Philadelphia
 BMNH—British Museum (Natural History), London
 CBA—Charles B. Adams
 IZW—Instytut Zoologiczny Warszawa, Poland
 MCZ—Museum of Comparative Zoology, Cambridge, Massachusetts
 MP—Museo Poey, Havana, Cuba
 USNM—United States National Museum, Washington, D.C.

All localities cited under *Specimens examined* without an acknowledgment to a museum are from the MCZ.

HISTORICAL REVIEW

Alcadia has been widely accepted since 1840, when it was introduced by Gray (Wenz, 1938; Keen, 1960), although some writers (C.B. Adams, 1849–1852; Sowerby, 1866; Reeve, 1874; Arango, 1879) ignored it. Pfeiffer (1852, 1858, 1865, 1876), in the various editions and supplements of his *Monographia Pneumonopomorum Viventium*, brought together the descriptions of various species, but provided little comparative material. A much more thorough monograph was published by Wagner (1907, 1910), who arranged the species

in a system based upon the shell and the operculum. He established several new subgenera and divided the species into *Formenkreise*. Unfortunately he overlooked earlier names (e.g., *Idesa* H. and A. Adams 1856) and separated other subgenera (e.g., *Eualcadia*) on insufficient grounds. But his contribution, as Baker (1922: 29) wrote, is a great advance on all previous work.

Wagner (1907) used the term *Formenkreis* to designate a group of species of infrasubgeneric status. Almost all the *Formenkreise* bear the name of the one of the species in the group. In no case is the *Formenkreis* provided with a description or diagnosis. H. B. Baker (1922) and others accepted some of these *Formenkreis* names as subgenera, with the species name of the *Formenkreis* as the type-species by tautonymy. Keen (1960: 286) suggested that the status of the *Formenkreis* needs clarification. The question was briefly discussed by Mayr *et al.* (1953: 28f) who pointed out that *Formenkreis*, together with Rensch's *Rassenkreis*, though logical, was not widely followed by subsequent writers. In our opinion Wagner's *Formenkreis* names are nothing more than species-group names, designated by the trivial name of a species within the group, and hence should deserve no more taxonomic distinction than, for example, the "group of . . ." names used by Pilsbry in the Manual of Conchology. Although both Baker (1922) and Keen (1960) synonymized some of these nomina, we have not included Wagner's *Formenkreis* names in generic and subgeneric synonymies in order to obviate further taxonomic complications, because we feel these nomina are invalid. The nomina under discussion are the following:

- Palliat*a Wagner 1907, in Martini & Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 47
- Intusplicata* Wagner 1907, *ibid.*, p. 60
- Sericea* Wagner 1907, *ibid.*, p. 62.
- Incrustata* Wagner 1907, *ibid.*, p. 64
- Megastoma* Wagner 1907, *ibid.*, p. 66
- Nitida* Wagner 1907, *ibid.*, p. 68

- Mamilla* Wagner 1907, *ibid.*, p. 71
- Bellula* Wagner 1907, *ibid.*, p. 74
- Ampliata* Wagner 1907, *ibid.*, p. 76
- Tamsiana* Wagner 1907, *ibid.*, p. 78
- Gemma* Wagner 1907, *ibid.*, p. 81

The last two names on the list are not *Alcadia*.

New subgenera *Isoltia*, *Hjalmarsona*, *Penisoltia* were proposed by Guppy (1895) and Baker (1940, 1954). In the present work the new subgenus *Glyptalcadia* is introduced.

TAXOBASES

Alcadia was established by Gray (1840) on the basis of the basal notch or sinus which separates the peristome from the columella. This characteristic of shell morphology, together with certain features of the operculum, still constitutes the most reliable method of distinguishing members of the genus. Bourne (1911: 798), who investigated the anatomy of *A. palliata* (C. B. Adams) and *A. hollandi* (C. B. Adams) from Jamaica, concluded that in respects other than the two mentioned above, "*Alcadia* is similar to the point of identity to *Helicina*." Baker (1926) also noted the essential similarity of *Alcadia* with *Helicina* as described by Isenkrahe (1867). Remarks concerning proposed studies of the anatomy of Cuban helicinids were made previously (Clench and Jacobson, 1971a). Earlier, Troschel (1857: 82) expressed surprise that he could find little to distinguish the radula of *Alcadia* from that of *Helicina* in view of the difference in shell morphology. Thus the radulae of *Helicina* and *Alcadia* differ less than their opercula and shells.

The present study shows that *Alcadia s.l.* is recognizable by the presence of a basal notch or sinus, a basal tooth or tubercle which is a downward and outward extension of either the columella or of the umbilical margin of the basal callus, and the wedge-shaped internal lamella and groove on the columellar edge of the operculum (Fig. 2). Additionally the nature of the

periostracum—its presence or absence, its relative development and disposition on the shell—was found to be significant in characterizing some species of *Alcadia*.

Radula

The radula in various species of *Alcadia* has been investigated by Troschel (1857), Bourne (1911), and Baker (1922, 1926). We have examined the radulae of *major* Gray, the type-species of the genus *Alcadia* from Jamaica; *hispida* Pfeiffer, the type-species of the subgenus *Penisoltia* H. B. Baker; *rotunda* Orbigny, the type-species of the subgenus *Idesa* H. and A. Adams; *nuda* Arango and *incrustedata* Gundlach.

The radula of *Alcadia* (Fig. 1) exhibits the essential features of a helicimid (Troschel, 1857): a single central rachidian tooth (R), flanked by A, B, and C centrals and a lateral complex (LC) consisting of a comb-lateral and an accessory plate and a marginal complex (MC) consisting of numerous teeth or uncini. These structures can be abbreviated in the formula: (MC) (LC) C B A R A B C (LC) (MC).

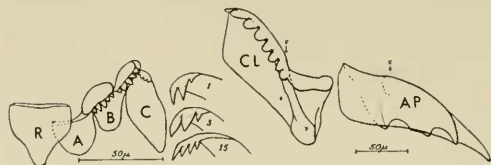
In the Helicininae, to which the genus *Alcadia* belongs, the marginal teeth all have sharp, acuminate cusps; the comb-lateral has a terminal shank, and the accessory plate on the outer end is highly variable. As described by Baker (1922), the A- and B-centrals have heavy, knob-like, cusp-bearing backs, the A-central having 4 or 5 cusps, the B-central 5; the C-central has 4 cusps, and the R-central is longer than broad (see below). The comb-

lateral of the capituliform complex has been described as having variously 4 to 7 large, spatulate cusps, but *A. major* Gray from Jamaica, the type-species of the genus, has a smooth, cusplless cutting edge. The taxonomic significance of this feature is not discussed in the present study. The marginal teeth, of variable number, between 82 and 125, have a laterally increasing number of cusps, the innermost 10 with 3 cusps, the next 5 to 7 with 4, the next 4 with 5 and the last ones with 6. Baker (1923: 119) writes that the trend in the Helicinidae seems to be a reduction of the central field, an increase in specialization of the lateral group, but only a comparatively slow change in the marginal complex.

In the Proserpininae, another important helicimid subfamily, the 14 to 24 inner marginals are unicuspid, the next 2 to 10 are bicuspid, and the rest have 3 large rounded cusps. The A- and B-centrals have 0 to 3 cusps and the C-central 1 to 4. The R-central is triangular-ovoid to broadly elliptical in shape. The T-shaped comb-lateral with a mesially located shank has 0 to 10 cusps, and the accessory plate is reduced in size and has a much reduced lateral wing.

Possessing a terminally placed vertical column of the comb-lateral tooth, *Alcadia* exhibits its affinities to the subfamily Helicininae, especially to *Helicina* itself. Indeed, Troschel (1857), investigating the radula of *A. rotunda* (Orbigny) and *A. palliata* C. B. Adams, noted that the central tooth (the R-central in Baker's terminology) was triangular or diamond-shaped in *Alcadia*. This tooth is usually button-shaped in *Helicina*. However, this distinction cannot hold because the R-central was found to be too variable. For example, *A. rotunda*, the type-species of the subgenus *Idesa*, has a button-shaped tooth.

Baker (1922) has presented the most detailed investigation of the helicimid radula to date. Among species of *Alcadia*, differences occur in the size of the accessory plate of the lateral tooth complex and



Text-figure 1. The radula of *Alcadia palliata* (C. B. Adams) from Jamaica (after Baker, 1922), showing the central rachidian tooth (R), the three centrals (A, B, C) the lateral complex with the comb lateral (CL) and accessory plate (AP) and three of the uncini (nos. 1, 5, 15) of the marginal complex.

in the cusps of the paired central teeth. In the Cuban species we studied (*hispidula*, *rotunda*, *nuda*, and *incrustedata*), the comb-lateral was strikingly similar. This structure has a high basal column and a narrow reverted upper margin with 4 to 6 large, triangular cusps. Although Baker (1922: 42) reported 7 cusps in *rotunda*, we could locate no more than 4. In contrast, *A. major* from Jamaica has a smooth edge with no visible cusps (Baker, 1922).

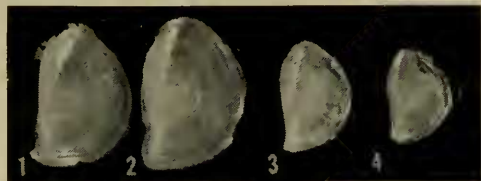
From these very sparse data, it is obvious that the radula cannot presently be used as a diagnostic feature for *Alcadia*. Accordingly, we have placed more emphasis on the features of the shell and periostracum in our investigation.

HABITATS OF ALCADIA

Within *Alcadia* s.l., there are two ecologically different groups: *Idesa*, which is largely arboreal, and those species of *Alcadia* s.s. and *Penisoltia* which are terrestrial, being found under dead leaves, rock, and in moss. Further, in the subgenus *Hjalmarsona*, both arboreal (*neebiana* Pfeiffer) and ground-dwelling forms (*nitida* Pfeiffer) are found. In contrast, other closely related heliciniids, such as *Eutrochatella* and other genera of the tribe Vianini in the subfamily Proserpininae, are all strict calciphiles, occurring largely on calcareous rock outcrops (Clench and Jacobson, 1968). Most of the species of *Helicina* s.s. are arboreal, living on the leaves of trees and bushes and quite free of the requirement for a rocky substrate.

In general the terrestrial species of *Alcadia* s.l. are drab and mostly brownish shells frequently incrustated with a deliscent periostracum.

The operculum, as mentioned previously, has a wedge-shaped internal lamella and groove on its columellar edge (Fig. 2). Although it does not possess the basal extension which Gray (1840) and Fischer (1885) ascribed to it, the operculum is capable of very tight closure in *Alcadia*. Apparently the closure is strengthened by the basal



Text-figure 2. Internal view of opercula of *Alcadia* showing internal lamella and groove on the columellar edge (all enlarged). 1) *Alcadia nuda bagaensis* Aguayo (MCZ 128775); 2) *A. nuda nuda* (Pfeiffer) (MCZ 90052); 3) *A. incrustedata* (Pfeiffer) (MCZ 74028); 4) *A. spectabilis* (Pfeiffer) (MCZ 74024).

notch or sinus into which the pointed tip of the operculum fits and in which it swivels like a door hinge.

This apparently allows for a strong closure of the operculum, possibly an adaptive feature for species living in the ground mulch or under rocks, for it enables them to resist small predators and dessication. In contrast the rock-dwelling vianine snails, with their calcareous opercula, can find protection by strongly applying the aperture to a hard rock surface.

The arboreal species of *Alcadia*, notably the members of *Idesa* as well as *Hjalmarsona neebiana*, tend to have a smooth, polished periostracum, being rather highly colored and polymorphic like species of *Helicina* s.s. Additionally, the operculum in this group is a less important protective organ and is indeed characterized by a weakened outer calcareous layer and, in general, a decidedly thinner structure.

DISTRIBUTION OF ALCADIA

Maps 1-3 show the distribution of the species of *Alcadia* in Cuba. The principal feature that emerges from this zoogeographic pattern is the disjunct nature of the occurrence of most of the species and subgenera. Excepting *Alcadia (Penisoltia) minima* (Orbigny) (Map 1), which is found in all six of the Cuban provinces (but not on the Isle of Pines) and which is evidently easily dispersed owing to its small size and broad ecological tolerance, the species of *Alcadia* present a more haphazard distributional pattern than any of



Map 1. The distribution of *Alcadia (Penisaltia) minima* in Cuba.

the groups previously considered. Of the vianine helicínids, both *Viana* and *Priotrochatella* are of limited distribution in Cuba in Pinar del Río and the Isle of the Pines respectively (Clench and Jacobson, 1968; 1970). *Ustronia*, *Troschelviana*, and *Semitrochatella*, also of vianine affinities, exhibit a zoogeographic pattern which indicates that the basic stock of these species entered Cuba via the west from the subtropical mainland of Mexico and Central America and subsequently spread eastward (Clench and Jacobson, 1971b). *Calidviana*, with its single species representing an invasion from the Bahamas (Clench and Jacobson, 1971b), is comparable to the *Alcadia nuda* complex in Oriente (Map 2).

The helicínine genera *Emoda* and *Glyptemoda* reflect a westward movement over the island from Oriente. Species of these genera have a wider ecological tolerance, and though usually confined to mountainous areas, they are not as closely restricted to limestone outcrops as is *Viana* and are sometimes found under leaves, branches, and vines in a ground-dwelling habitat. Like *Alcadia minima*, one species of *Emoda*, namely *E. submarginata*, is eurytopic and has a range embracing the entire island (Clench and Jacobson, 1971a). *Emoda* represents an element coming from the east, most probably Hispaniola, the other Antillean island which has numerous

faunal elements in common with Cuba, and which may have been directly connected with it during the Tertiary (Weyl, 1966).

How then may one interpret the distribution of the majority of the species of *Alcadia* in Cuba?

An examination of the Jamaican species shows that many are so close morphologically and analogous ecologically to Cuban species, without any corresponding Hispaniolan forms, that it is difficult to deny the immediate relationship of Jamaican and Cuban species. Following the beautifully reasoned and skillfully presented argument of Darlington (1938), one can accept the assumption that the original stock of *Alcadia* was derived from the mainland of Central America and underwent a primary evolutionary radiation in Jamaica.

Darlington (1938: 295) suggested that the main contact between Jamaica and Cuba, geologically and probably faunistically, was via Hispaniola. He placed the direct connection Jamaica-Cuba in a secondary position, and in all probability a series of archipelagos existed in this area during the late Tertiary (Khudoley and Meyerhoff, 1971). Various authorities were cited by Darlington to indicate direct faunal relationship between Jamaica and Cuba, but the evidence amassed is contradictory.

Both Jamaica and Cuba each have about 18 species and subspecies of *Alcadia*,

whereas Hispaniola only has about ten, four of which belong to the subgenus *Analcadia*.¹ Of note is the occurrence of the subgenus *Ideza* in both Cuba and Jamaica and its absence from Hispaniola.

Of the Cuban *Alcadia*, only a minor element was almost certainly not derived from the Jamaican fauna. *Alcadia binneyana* Pfeiffer 1866 from Hispaniola appears to be the ancestor of *A. spectabilis* in Oriente, Cuba. Since *binneyana* is reported only from Haiti and *spectabilis* occurs only in Oriente, the Cuban area closest to the Haitian portion of Hispaniola, *spectabilis* may be assumed to be the result of a more or less isolated invasion.

In many cases the morphological similarities are so close between the Jamaican and Cuban species that the Cuban forms must be assumed to have been comparatively recently introduced. Dispersal of elements from Jamaica to Cuba was probably effected as the result of hurricanes. The paths of these tropical storms are strongly suggestive (Darlington, 1938: fig. 1). Further, among the Helicinidae of Cuba, at least one other example of a probable invasion from Jamaica has been suggested for *Priotrocharella* in which the species of the Isle of Pines appear to have been derived from *P. josephinae* (C. B. Adams) of Jamaica

(Henderson, 1916; Clench and Jacobson, 1970).

Table 1 summarizes the data on analogous species from Jamaica and Cuba. An explanation of the conchological and morphological similarities between Jamaican and Cuban forms is beyond the scope of this monograph, but suffice it to say that such factors as size, outline, and color as well as the nature of the basal sinus and tooth show striking resemblances.

This hypothesis suggests that *Alcadia* did not undergo extensive evolutionary radiation in Cuba. Excepting two elements, one from the Bahamas and the other from Hispaniola, the majority of the Cuban forms were introduced from Jamaica and appear to have retained much of their original character with slight modification. Furthermore, it is most likely that they arrived via the mechanism of hurricane winds. Certainly they have remained more or less fixed in the areas where they arrived and found favorable ecological conditions for survival similar to those in Jamaica.

Since *Alcadia* simply does not exhibit a pattern of distribution such as those found in *Emoda* or the vianine genera which reflect their evolutionary history on the island (Clench and Jacobson, 1968; 1970; 1971a and b), this notion explains why, of the 17 specific and subspecific taxa of *Alcadia* which we recognise in the Cuban fauna, no fewer than 13 (and probably 14) occur in only a single province. It will also

¹ We have not considered the subgenus *Analcadia* Wagner 1907, since it occurs neither in Cuba nor Jamaica.

TABLE 1. COMPARISON OF CLOSELY RELATED SPECIES OF THE GENUS *Alcadia* IN JAMAICA AND CUBA. THE ECOLOGICAL PREFERENCES ARE TAKEN FROM H. B. BAKER (1934) FOR JAMAICA AND ARANGO (1879) FOR CUBA

Jamaican species	habitat	Cuban species	habitat
<i>megastoma</i> C. B. A.	fair climber	<i>rotunda</i> Orb.	trees
<i>dubiosa</i> C. B. A.	ground	<i>hispida</i> Pfr.	under rocks, leaf litter
<i>hollandi</i> C. B. A.	weak climber,	<i>velutina</i> Poey	on rocks
<i>pusilla</i> C. B. A.	mainly ground	<i>minima</i> Orb.	under rocks
<i>major</i> Gray	rock basis	<i>nuda</i> Arango	on trees
<i>solitaria</i> C. B. A.	no data	<i>dissimulans</i> Poey	on rocks



Map 2. The distribution of the subgenera *Hjalmarsona* (H), *Alcadia* s. s. (A), and *Idesa* (I) in Cuba.

account for the presence of such analogous forms as *A. nitida* in the western part of the island and *A. neebiana* in Oriente.

The distribution of the subgenera also bears out our premise. Either we find species of the same subgenus in widely separated areas (*e.g.*, *Idesa* in Pinar del Río and Oriente, Map 2; *Hjalmarsona* in the west in Pinar del Río, Habana, and Matanzas and in the east in Oriente, with no forms in intervening Las Villas and Camagüey, Map 2) or we find them in a single, more or less restricted area (*e.g.*, *Alcadia* s.s. only in Oriente, Map 2; *Glyptalcadia* in Oriente and Camagüey, Map 3). Only *Penisoltia*, to which the ubiquitous *minima* belongs, is found in all provinces as well as on the Isle of Pines (Maps 1 and 3).

SYSTEMATIC SECTION

GASTROPODA

PROSOBRANCHIA

Family HELICINIDAE Latreille, 1825

Subfamily HELICININAE Latreille, 1825

Genus *Alcadia* Gray

Alcadia Gray, 1840. Synopsis Contents British Mus., 42nd ed., pp. 134, 153 (or 130, 149) (type-species, *Helicina major* Gray, 1825, subsequent designation, Gray, 1847).

Isoltia Guppy, 1895. Proc. Victoria Inst. Trinidad, Part 2, p. 76 (type-species, *Helicina nuda* "Arango" Pfeiffer, 1866; by monotypy).

Eualcadia Wagner, 1907. In Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 47 (type-species, *Helicina major* Gray, 1825, subsequent designation, H. B. Baker, 1922).



Map 3. The distribution of the subgenera *Penisoltia* (P) (except *A. P. minima*) and *Glyptalcadia* in Cuba.

Eucaladia Wagner, 1907. *Ibid.*, p. 46 (spelling error for *Eualcadia*).

Description. Shell moderately large (about 20 mm in width, 15 in height) to quite small (about 5 mm in width, 4 mm in height); depressed turbinate to almost lenticular; moderately strong; surface sculpture generally light, periostracum smooth, pilose or hirsute; peristome simple to moderately flaring; basal sinus small to curved and long. Operculum deeply concave with a variously thin but well-formed outer calcareous layer and an inner, generally horn-colored, thin corneous layer; thickest at the columellar margin; inner surface with a variously shaped, elongate ridge set off by a parallel furrow; outer margin bladelike; nucleus eccentric near the columellar margin.

Remarks. The shell of the members of the genus are distinguished by the presence of a basal notch or sinus, usually accompanied by a variously shaped and sized tooth or tubercle near the columella. The pilose or hirsute periostracum is diagnostic for the subgenera *Alcadia* s. s. and *Penisoltia*; in *Hjalmarsona* and *Idesa* the shell is generally quite glossy.

The operculum differs from that of *Helicina* s. l. in several respects: In *Helicina neritella* Lamarck, the type-species of the genus *Helicina*, the outer calcareous layer is very thin and does not extend to the upper, outer, and lower margins of the strong, dark reddish brown chitinous layer. Here the main structure is the chitinous layer, the calcareous layer appearing as a weak concretion. In addition the operculum is only slightly thicker at the columellar margin, becoming thin rapidly and remaining equally thin for the major portion of the structure. The edges present a frayed appearance probably because in this way they insure complete closure when the animal is retracted. There is no sign of the heavy internal wedge-shaped lamella of *Alcadia*.

In *Alcadia major* the calcareous layer is thick and strong, thinning out only when the outer margins are reached. It is twisted

when viewed from the edge whereas in *Helicina* the operculum is almost on a single plane. The inner chitinous layer is very thin, frequently film-like, reaching well beyond the margins of the calcareous layer, even on the columellar edge. Closure here is insured by the extension beyond the margin. Thus in *Alcadia* the calcareous layer is the stronger one, the chitinous appearing only as a thin, internal skin.

KEY TO THE SUBGENERA OF *Alcadia*

1. Shell surface roughly and irregularly sculptured GLYPTALCADIA
Shell surface comparatively smooth 2
2. Shell robust, generally large, palatal lip well developed ALCADIA s. s.
Shell fragile, smaller, lip weakly developed 3
3. Periostracum hirsute or pilose, deciduous
..... PENISOLTIA
Periostracum glossy, persistent 4
4. Spire elevated, frequently colorful IDESA
Spire more or less depressed, drab
..... HJALMARSONA

Subgenus *Alcadia* s. s. Gray

Type-species, *Helicina major* Gray, 1825; subsequent designation, Gray, 1847.

Description. Shell large, strong; periostracum hirsute; operculum strong; basal notch and tubercle weakly developed; palatal lip strong, expanded, occasionally reflected.

Remarks. Our concept of *Alcadia* s. s. differs somewhat from that of Wagner and is here presented provisionally. A proper placement of all species must await more radular and anatomical investigation. However, the characteristics of the shell have always been considered diagnostic for the genus.

KEY TO THE SPECIES OF *Alcadia* S. S.¹

1. Shell small, up to 9 mm in width *incrustata*
Shell larger, 11 to 15 mm in width 2
2. Shell up to 15 mm in width, lip thickened, strongly reflected *nuda nuda*

¹ These artificial keys to the species of the various subgenera of Cuban *Alcadia* are based on distinctions apparent in large lots rather than individual specimens and are thus more useful in determining populations than single specimens or small lots.

Shell up to 12 mm, lip thickened but not reflected *n. багаensis*

Alcadia (Alcadia) nuda nuda
(Pfeiffer)

Plate 2, figures 7–9; Text-fig. 2; Map 2

Helicina nuda "Arango" Pfeiffer, 1866. Malak. Blät., 13: 63 (type-locality, Barigua, [Baracoa, Oriente] type destroyed; specimen here figured, MCZ 90052, T. Bland Collection *ex* Arango). Pfeiffer, 1876, Monographia Pneumonopomorum Viventium, suppl. 3, p. 253. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 50. Crosse, 1890, Jour. de Conchyl., 38: 317, pl. 6, figs. 5, 5a–d.

Helicina nodae Reeve, 1873. Conch. Icon., vol. 19, *Helicina*, pl. 11, fig. 93 [not *Helicina nodae* Arango, 1862].

Alcadia (Eualcadia) nuda (Arango) Pfeiffer. Wagner, 1907, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 64, pl. 16, figs. 9–12.

Description. Shell reaching about 11 mm in height, 15 mm in width, depressed conic, smooth, lusterless, solid. Color pale yellow or white, lip and basal callus white. Whorls 5½, slightly convex, increasing rapidly in size. Body whorl about twice as wide as penultimate, obtusely carinate, more rounded and not descending near aperture; base moderately inflated. Aperture broadly triangular, white or yellow within, rounded peripherally, straight basally. Parietal callus white, slightly raised, gleaming, rounded at outer margin, somewhat larger than aperture. Palatal lip thickened, rounded, reflected, narrower at both insertions, not extended above; small, rounded, outwardly directed tooth at columellar angle set off from lip by small, shallow labial sinus. Columella oblique, almost flat above, weakly rounded below. Suture well impressed. Sculpture of irregular, moderately strong, diagonal growth lines; occasional specimens with a few, widely spaced, spiral striae, varying in strength. Axial lineolations within shell substance straight, about twice as wide as their intervals. Protoconch 1½ whorls, white, rounded, microscopically and sparsely punctate, slightly raised above succeeding

whorls. Periostracum deciduous, lost in subadult and adult, pilose, reddish brown. Operculum as in genus, outer calcareous layer thin, translucent, minutely granulate; inner chitinous layer pale brown near columellar edge, dark reddish brown at outer margin; inner wedge-shaped lamella well developed.

height in mm	width in mm	
11.5	14.5	Barigua, Baracoa
11.4	14.6	Mesa Grande del Sapote, Baracoa
10.9	15.2	Barigua, Baracoa

Remarks. This species differs from other Cuban *Alcadia* because of its solid texture and thickened, reflected lip. The basal tooth does not emerge from the callus, as in the other species of *Alcadia* but is a clear expansion of the palatal lip. The basal sinus is smaller and the entire structure near the columella is more like *Emoda* than *Alcadia*. However, since it has an unmistakable *Alcadia*-like operculum it seems best to keep it in that genus where it was first placed by Wagner (1907).

The periostracum is very deciduous and in most specimens appears only as a very narrow relic left in the sutures and the crevices between the growth lines. Even in a subadult specimen from Mesa Grande del Sapote with an unformed lip, only a small area of untouched periostracum on an early postnuclear whorl was found.

The species is restricted to a small area around Barigua, Baracoa, Oriente Province. Arango (1879) reported that it lives on trees, but this is unlikely because of its heavy, deciduous periostracum. It probably is a ground-dwelling form occurring under rocks and dead leaves where the related species *A. incrustata* is said to live (Pfeiffer, 1860; Arango, 1879).

The white or pale yellow color and the *Alcadia*-like operculum will separate *nuda* from species of *Emoda*, while the heavy, rounded and reflected lip will distinguish it immediately from the other Cuban *Alcadia*.

Specimens examined. ORIENTE. Barigua, Baracoa; Mesa Grande del Sapote, Baracoa.

Alcaldia (Alcaldia) nuda bagaensis

Aguayo

Plate 1, figures 7–9; Text-fig. 2; Map 2

Alcaldia nuda bagaensis Aguayo, 1953. *Memorias de la Sociedad Cubana de Historia Natural*, 21: 301, pl. 33, figs. 4–5 (type-locality, Bagá, Baracoa, Oriente; holotype MP 17315.)

Description. Shell like that of nominate subspecies but differing in smaller size, thickened but not reflected lip, and in more persistent periostracum.

height in mm	width in mm	
10.2	12.4	El Bagá, Maisí, Oriente
9.2	11.0	El Bagá, Maisí, Oriente

Remarks. This subspecies has the solid, smooth shell of *nuda nuda* with the same coloration, a bit more vivid in some individuals. The periostracum has numerous irregular, narrow, spiral ridges and persists moderately well even in adult shells. It closely resembles *incrustedata* Pfeiffer, but it has a relatively more thickened lip and weaker periostracum and is considerably larger.

Bagá lies about 20 km to the southeast of Barigua, the type-locality of the nominate subspecies. The intervening territory is mountainous. This subspecies is thus geographically as well as morphologically justified (Aguayo, 1953).

Specimens examined. ORIENTE. El Bagá, Maisí, Oriente.

***Alcaldia (Alcaldia) incrustedata* (Pfeiffer)**

Plate 2, figures 10–12; Text-fig. 2;

Map 2

Helicina incrustedata "Gundlach" Pfeiffer, 1859. *Malak. Blät.*, 6: 80 (type-locality, Yateras, Guantánamo, Oriente, type destroyed; specimen here figured MCZ 74028, J. G. Anthony Collection ex Poey). Sowerby, 1866, *Thes. Conchyl.*, 3: 280, pl. 2 (267), fig. 50.

Alcaldia incrustedata Gundlach, Pfeiffer, 1865, *Monographia Pneumonopomorum Viventium*, suppl.

2, p. 249. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 57.

Alcaldia (Eualcaldia) incrustedata (Gundlach) Pfeiffer, Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 64, pl. 16, figs. 5–8.

Description. Shell reaching about 9 mm in width, 7 mm in height, depressed-globose, solid, smooth, sublustrous under periostracum. Whorls 5, faintly convex, increasing rapidly in width. Body whorl one-half again as wide as penultimate, well rounded, not descending at aperture; base moderately inflated. Color pale yellow, light brown or white, lip and basal callus white; frequently covered by dark brown or black encrusted periostracum. Aperture oblique, semi-lunate, evenly rounded, somewhat flattened dorsally and ventrally. Palatal lip noticeably thickened within, not indented at upper insertion, weakly expanded but not reflected, somewhat narrower above, narrowest below; with small, rounded tubercle near columella; basal sinus wanting or barely perceptible, sublustrous, weakly granulate, indistinctly delimited parietally and with shallow, uneven groove separating it at umbilical area. Columella oblique and slightly convex above, shallowly rounded below. Suture strongly impressed. Sculpture consisting of diagonal, irregular growth lines only. Lineations within shell substance closely spaced, narrow, white, not sinuous. Protoconch $1\frac{1}{2}$ whorls, rounded, minutely and thickly punctate, raised slightly above succeeding whorls. Periostracum dense, pilose, deciduous, occasionally with higher hairs arranged in wide spiral row. Operculum as in genus, calcareous layer white, somewhat roughened on outer surface; chitinous layer very thin, light brown, darker at palatal margin; inner wedge-shaped lamella moderately developed.

height in mm	width in mm	
7.5	9.4	Yateras
6.4	8.3	Yateras
6.3	8.4	Cayojuán, Baracoa
6.2	7.5	E of Puerto de Baracoa

Remarks. This species is readily recognized by the relatively strong shell, thickened and slightly reflected peristome, small basal tooth with a very small or altogether absent labial sinus. It looks like a miniature *A. nuda bagaensis*, but the shell is strikingly smaller, the lip relatively thinner, the yellow or orange color, when present, more vivid, and the periostracum thicker and more persistent. It ranges from the southern part of the municipio of Baracoa to Yateras, thus lying more to the south than the range of *nuda*.

Pfeiffer (1865) quoted Gundlach's description of the animal: "... light brownish, the rugosities on the foot and tail with small gray spots. Head and neck appear darker brown because of the visceral mass showing through. Tentacles gray, darker at the base than at the tip," (translated). He also noted that the species occurs under rotten leaves and Arango (1879) added that it was also found under rocks.

Specimens examined. ORIENTE. Baracoa: Maisí (USNM); Jauco; Nibujón; Cayojuín; El Paraiso; E of Puerto de Baracoa; Guantánamo; Yateras; Monte Líbano; near Malabé (USNM).

Subgenus *Idesa* H. and A. Adams

Idesa H. and A. Adams, 1856. Genera of Recent Mollusca, 2: 304; type-species *Helicina rotunda* Orbigny, 1845, subsequent designation, H. B. Baker, 1922.¹

Schrammia Guppy, 1895. Proc. Victoria Inst. Trinidad, Part 2, p. 75 (type-species *Helicina conuloides* Guppy, 1868, by monotypy).

Leialcadia Wagner, 1907. In Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 65; type-species, *Helicina rotunda* Orbigny, 1845, subsequent designation, H. B. Baker, 1922.

Description. Shell small, about 6 to 9 mm in width, 4 to 8 mm in height, subglobose, colorful, often glossy, basal tooth and sinus not conspicuous. Periostracum

not hirsute, persistent, occasionally bearing bright colors. Operculum as in genus, rather thin. Arboreal.

Remarks. Two of the three species we place in *Idesa* are among the most brightly colored forms in *Alcadia*. In this respect they can be compared to *Helicina* s. s. with which they share the same leafy habitat. It is noteworthy that these two species are completely allopatric: *rotunda* is found in Pinar del Río in the west and *spectabilis* in Oriente in the east. No forms occur in any of the intervening provinces.

Although *Idesa* exhibits a unique disjunctive distribution, something similar is found in two sympatric species of the helicinid *Proserpina*. Both species of *Proserpina* have disjunct ranges with populations occurring in the west, including Pinar del Río and neighboring Havana, and in Oriente without any intervening.

Wagner (1907) and others placed some of the fragile, rather drably colored, depressed species of *Alcadia* in *Idesa* (*Leialcadia* Wagner), but we think they show affinities with *Hjalmarsona* H. B. Baker.

KEY TO THE SPECIES OF *IDESA*

1. Shell relatively small, 6 mm wide or less, surface not too glossy; distribution limited to SW corner of Oriente Province *concinna*
Shell larger, 7 to 9 mm wide, surface quite glossy 2
2. Shell color often uniform throughout or with darker spire, color bands always wanting; distribution limited to Pinar del Río Province and western part of Habana Province
..... *rotunda*
Shell generally colorful, frequently ornamented with color bands; distribution limited to southern and east-central Oriente Province *spectabilis*

Alcadia (Idesa) rotunda (Orbigny)

Plate 2, figures 4–6; Map 2

Helicina rotunda Orbigny, 1842. Mollusques, in Sagra, Histoire Physique, Politique, et Naturelle de l'île de Cuba, 1: 252, pl. 21, figs. 1–3 (type-locality, here restricted, Pan de Guajabón,²

¹ Fischer (1885: 795) cited *H. rotunda* with *Idesa*, but since he did not clearly indicate that this was a type-selection, it must be regarded as an example and not as a type. For this reason the type-selection must date from Baker, 1922, even though the latter credited it to Fischer.

² Orbigny gave only his usual "interieur de l'île" as the locality. Jaume (1945: 75) found it in abundance at the Pan de Guajabón.

Pinar del Río, Cuba); type in BMNH. Sowerby, 1842, *Thes. Conchyl.*, 1: 13, pl. 3, fig. 111; 1866, *Thes. Conchyl.*, 3: 280, figs. 51–52. Pfeiffer, 1852, *Monographia Pneumonoporum Viventium*, p. 357. Reeve, 1873, *Conch. Icon.*, vol. 19, *Helicina*, pl. 4, fig. 29. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 53. Crosse, 1890, *Jour. de Conchyl.*, 38: 320.

Helicina campanula Pfeiffer, 1849. *Proc. Zool. Soc. London*, p. 120 (type-locality, Cuba; type destroyed); 1850, *in* Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 1, p. 41, pl. 9, figs. 12–13; 1852, *Monographia Pneumonoporum Viventium*, p. 374. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 53. Crosse, 1890, *Jour. de Conchyl.*, 38: 321.

Helicina retracta Poey, 1852. *Memorias Historia Natural Isla de Cuba*, 1: 116, pl. 12, figs. 22–26 (type-locality, Cayajabos, Pinar del Río; type, probably in MP). Pfeiffer, 1858, *Monographia Pneumonoporum Viventium*, Suppl. 1, p. 194. Sowerby, 1866, *Thes. Conchyl.*, 3: 280, figs. 54–55. Reeve, 1873, *Conch. Icon.*, vol. 19, *Helicina*, pl. 5, fig. 39. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 51. Crosse, 1890, *Jour. de Conchyl.*, 38: 318.

Alcaldia (Leialcaldia) rotunda Orbigny. Wagner, 1907, *in* Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 69, pl. 11, fig. 13.

Alcaldia (Leialcaldia) rotunda campanula Pfeiffer. Wagner, 1907, *ibid.*, p. 70, pl. 11, figs. 9–12.

Alcaldia rotunda (Orbigny). Jaume, 1945, *Rev. Soc. Malac. Carlos de la Torre*, 3: 75.

Description. Shell reaching about 9 mm in width, 8 mm in height, globose-turbinate, more or less glossy (in some populations exceedingly so), rather solid, smooth. Whorls almost 6, slightly convex, increasing gradually in width. Body whorl about $2\frac{1}{2}$ times wider than the penultimate, evenly rounded, inflated, slightly descending at aperture; base inflated. Color varied: lemon or greenish yellow, pale buff or light flesh colored, spire occasionally darker. Aperture oblique, rounded triangular, somewhat flattened above, angularly rounded at periphery. Palatal lip thin, barely expanded centrally, simple at both terminations, slightly sigmoid above; basal sinus very wide and shallow. Basal callus indistinctly delimited parietally and in umbilical region by rather wide, shallow, curved groove; lustrous, finely granulate, occasionally brownish red or bright yellow. Columella oblique, almost flat above, thickened and

weakly concave below, set off from umbilical area by shallow groove and extended outward to merge with low, wide, rounded tubercle near shallow labial sinus. Suture well impressed. Sculpture of fine, irregular growth lines, occasionally with some weak, spiral striae. Axial lineolations within shell substance regular, closely set, weakly sinuous, most noticeable on base. Protoconch $1\frac{1}{2}$ whorls, rounded, minutely and regularly granulate, slightly raised above succeeding whorl. Periostracum thin, persistent, colorless. Operculum as in genus, outer layer thin, glassy, roughly pitted; chitinous layer very thin, light brown; inner wedge-shaped lamella well developed.

height in mm	width in mm	
8.0	9.2	Pan de Azúcar
7.3	7.8	Subido a Rangel
6.7	8.3	Cafetal "La Villa," Candelaria
6.7	7.7	El Mamey, Cayajabos
6.5	8.0	Sierra Viñales
6.3	7.2	El Taco, Rangel

Remarks. This species, confined to Pinar del Río Province, can be recognized by the rather colorful, generally glossy shells, the subglobose outline, and the relatively weak construction of the basal tooth and labial sinus. It is close to *nitida* in size but the latter is more depressed, less glossy and has a rather stronger development of the basal tooth and labial sinus. According to Arango (1879: 53), *rotunda* lives on trees in the entire area of the Sierra de los Organos, whereas *nitida* (*ibid.*: 46) lives in leaf litter and under rocks on the ground, and has a more extensive distribution to Matanzas.

A. rotunda is more elevated, smaller, glossier and more brightly colored than *disimulans*. In addition the basal sinus is decidedly shallower.

Though the shell of *rotunda* can be easily recognized, some variations do exist. In the Sierra de la Chorrera at San Vicente the colors are frequently more vivid and the aperture and parietal area darker than the rest of the shell. In occasional individ-

uals the spire is darker and more vividly colored than the body whorl. Reddish forms occur at Caiguanabo and Cayajabos, while the population at Pan de Azúcar is largely yellow in color. At El Taco, Rangel, the shells are glossier, thinner, and occasionally a few narrow, indistinct, interrupted and widely spaced spiral bands appear on the body whorl. It is important to note that no large lots from a single locality are uniform in color. Poey's *retracta* from Cayajabos was established on a color-form of *rotunda*.

Pfeiffer (1856: 146) transcribed Gundlach's notes on the animal which we translate as follows: "Animal whitish; a lateral band originating under the eyes as well as the tentacles are dark gray."

Specimens examined. PINAR DEL RÍO. La Tenería, Guane; Luis Lazo; Valle de San Carlos, Luis Lazo; Ensenada San Carlos, opposite Sierra Los Acostas, Luis Lazo; Sumidero; Cabezas; Bebedero; Mogote Cerro de Cabras; Kilometer 14 road to Luis Lazo (all USNM). *San Vicente*: La Chorrera; Hoyo Jaruco, La Chorrera (USNM); paredones N side of La Chorrera (USNM); valley E of Baños de San Vicente (USNM); Mogote Pequeño; Mogote Ensenada de San Vicente (USNM); Costanera de San Vicente; Hoyo de Magdaleno, Costanera de San Vicente; Puerta del Ancón (USNM). *Viñales*: Mogote del Refugio; El Queque; Hoyo de Gallardo, El Queque; Mogote Puertecitos; Mogote Capón; Mogote de Justo; Potrero de Miguel Pino, Dos Hermanos; Mogote Mármol (USNM); Laguna de Piedra; Mogote La Jutía, Laguna de Piedra; Valle de Las Delicias; Pan de Azúcar (USNM); Sierra Viñales. *Consolación del Norte (La Palma)*: Mogote Palmar, 1 km S of La Palma; La Furnia, Sierra la Güira, San Andrés; Mogote Talavera. *San Diego de los Baños*: Caiguanabo; Los Portales de Caiguanabo. *Rangel*: Subido de Rangel; El Taco; El Retiro; Sierra de Rangel at 1500 ft. (USNM); Río Santa Cruz de los Pinos; Rangel Arriba (USNM); El Guabinacho, Rangel Abajo (USNM);

Espiro, Rangel Abajo (USNM); gorge of Río Taco Taco; Bahía Honda; Pan de Guajaibón. Loma del Cuzco, Candelaria (USNM); Peña Blanca, Cuzco (USNM); Cafetal "La Villa," Candelaria (USNM); El Mogote (USNM); El Mamey, Cayajabos; Guanajay; between Guanajay and Artemisa (USNM); km 55 between Artemisa and Havana. HABANA. Sierra Anafe.

Alcadia (Idesa) spectabilis (Pfeiffer)

Plate 3, figures 1–3; Plate 6, figures 1–9; Text-fig. 2; Map 2

Helicina spectabilis "Gundlach" Poey, 1858. *Memorias Historia Natural Isla de Cuba*, 2: 5 [nomen nudum].

Helicina spectabilis "Gundlach" Pfeiffer, 1858. *Malak. Blät.*, 5: 48 (type-locality, here restricted, Buenavista near Bayamo, Oriente; type destroyed; specimen here figured, pl. 6, figs. 1–3, MCZ 74031, J. G. Anthony Collection ex Gundlach). Sowerby, 1866, *Thes. Conchyl.*, 3: 287, figs. 246–247. Reeve, 1873, *Conch. Icon.*, vol. 19, *Helicina*, pl. 17, fig. 147. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 52. Crosse, 1890, *Jour. de Conchyl.*, 38: 320.

Helicina bellula "Gundlach" Pfeiffer, 1860. *Malak. Blät.*, 6: 79 (type-locality, Yateras, Guantánamo, Oriente; type destroyed; specimen here figured, pl. 3, figs. 1–3, MCZ 74024, J. G. Anthony Collection ex Gundlach). Sowerby, 1866, *Thes. Conchyl.*, 3: 289, pl. 9 (274), figs. 305–308. Reeve, 1873, *Conch. Icon.*, vol. 19, *Helicina*, pl. 10, fig. 83. Arango, 1879, *ibid.*, p. 52. Crosse, 1890, *Jour. de Conchyl.*, 38: 320.

Helicina bellula var. *suturalis* "Gundlach" Pfeiffer, 1860. *Malak. Blät.*, 6: 80 (type-locality, La Cubana, Yateras, Guantánamo; type destroyed; specimen here figured, pl. 6, figs. 7–9, MCZ 74029, J. G. Anthony Collection ex Gundlach).

Helicina bellula var. *peripherica* "Gundlach" Pfeiffer, 1860. *Ibid.*, p. 80 (type-locality, Monte-verde, Monte Libano, Guantánamo; type destroyed; specimen here figured, pl. 6, figs. 4–6, MCZ 74030, T. Bland Collection ex Gundlach).

Helicina spectabilis minor Pfeiffer, 1862. *Ibid.*, 9: 8 (type-locality, Loma del Gato, Cobre, Oriente; type destroyed) [nomen nudum].

Helicina bellula var. *yunqueensis* Pfeiffer, 1865. *Monographia Pneumonoporum Viventium*, suppl. 2, p. 231 (type-locality, Yunque de Baracoa, type destroyed).

Alcadia (Leialcadia) spectabilis (Gundlach) Poey. Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 75, pl. 13, figs. 13–16.

Alcadia (Leialcadia) spectabilis venusta Wagner, 1907. *Ibid.*, p. 76, pl. 13, figs. 17–18 (type-

locality, here restricted, Santiago de Cuba; type, IZW).

Alcadia (Leialcadia) bellula bellissima Wagner, 1907. *Ibid.*, p. 75, pl. 12, figs. 9–12 (type-locality, Baracoa; type, IZW 8380).

Alcadia (Leialcadia) bellula leptochula Wagner, 1907. *Ibid.*, p. 75, pl. 12, figs. 13–14 (type-locality, Monte Toro; type, IZW).

Helicina polychroa Reeve, 1873. *Conch. Icon.*, vol. 19, *Helicina*, pl. 17, fig. 153 (type-locality, Cuba; type-specimens, BMNH).

Description. Shell generally about 7.5 mm wide, 6.5 mm high, larger in some populations, moderately strong, subglobose, lustrous. Whorls $5\frac{1}{2}$, moderately rounded, increasing rapidly in width. Body whorl rounded, about $2\frac{1}{2}$ times wider than the penultimate and gradually descending near the aperture; base moderately inflated. Color varied; yellowish white, greenish yellow, light yellowish brown or pale orange, sometimes unicolored, frequently ornamented with a reddish brown sutural or peripheral band of varied width; protoconch occasionally similarly colored. Aperture slightly oblique, subtriangular, rather rounded at periphery. Palatal lip thin, entire, flaring, less so at basal insertion, separated from body whorl by a shallow groove which becomes obsolete at both insertions; a low, rounded tubercle near the columella. Parietal area with a slightly raised, minutely granulate subcircular basal callus, about as large as aperture, with an irregularly curved parietal margin, umbilical margin terminating in palatal tubercle. Columella little convex above, slightly rounded below, merging with the labial tubercle. Suture well impressed, occasionally distorted near the aperture at the terminations of the strong growth lines. Sculpture of rather strong, irregular growth lines only. Axial lineolations within shell substance rather wide, closely spaced, slightly sinuous. Protoconch $1\frac{1}{2}$ whorls, white, pale yellow or bright reddish brown, rounded, minutely granulate, barely raised above succeeding whorls. Periostracum thin, yellow, persistent, and deciduous only in long dead specimens. Operculum as in subgenus, thin, pale brown.

height in mm	width in mm	
6.7	7.3	Monte Libano, Guantánamo
6.5	7.5	Yateras
6.5	7.2	Cubana, Yateras
8.2	8.4	Pico Turquino, 2,500 ft.
6.5	7.5	Pico Turquino, 2,500 ft.
6.4	6.9	El Yunque de Baracoa

Remarks. This is a highly variable species confined to the southern and east-central parts of Oriente Province where it is to be found on trees and bushes. The shells vary in size, texture, and especially in color. Several variations were given subspecific names but they may safely be rejected. As we shall show later, these morphologic distinctions frequently occur in the same population. Shell morphology sometimes appears to be more stable in single populations; however, this usually is the result of small samples or selective collecting. Even in such cases, some characteristics that predominate in one population are not confined to that population but appear in other populations as well. Wagner (1907: 74) noted the sexually dimorphic characters of shells, *i.e.*, inflatedness of whorls and shape of the apertures from the same population without any intergrades. Many helicinids show such dimorphism.

Wagner (1907) gave the subspecific name *bellissima* to a population of *spectabilis* from Baracoa on the basis of its smaller size, transparent grayish blue or yellow color, and wider palatal lip. But some specimens from the Yunque de Baracoa are only slightly smaller than specimens from La Caridad, Guantánamo, and, in color, strongly resemble samples from populations at Pico Turquino. Thus we are dealing with a population differing slightly from the "typical" and with characteristics found in other populations. The varieties *peripherica* and *suturalis* of Pfeiffer are admittedly found in the same populations with differently colored shells (Pfeiffer, 1860: 80).

The population on the Pico Turquino in Sierra Maestra taken at an altitude of

2,500 feet has the shell more elevated and the lip somewhat wider. The color varies from pale yellow to pale bluff, ornamented with either a reddish brown spot on the protoconch and/or a sutural band on the earlier postnuclear whorls which, in occasional specimens, continues as a peripheral band on the body whorl.

In contrast, the population at La Caridad, Monte Toro, Guantánamo, consists of specimens entirely colored yellow, varying only slightly in the intensity of the color. They are smaller than samples from other populations and the lip may be narrower and less strongly expanded. The subspecific name *venusta* Wagner was given to small, rather fragile forms, but since Wagner cited them from Santiago de Cuba, Bayamo, and Rancho Lucas, he was obviously dealing with ecophenotypic specimens found under less than favorable ecological conditions. The subspecific name *leptochila* was also applied to a form chiefly distinguished by its smaller size.

There is little reason to doubt that in *bellula*, Pfeiffer (1860) was redescribing his *spectabilis* (1858). According to both descriptions, the shells of these two species differ mainly in color, a very variable feature in many arboreal mollusks, pulmonates as well as prosobranchs, and a feature which, in this case, is not of specific significance: the nomina *bellula* and *spectabilis* apply to the same species.

Pfeiffer (1860: 79) quotes Gundlach's notes on the animal, which we translate as follows: "Animal white with ochre-colored sheen; tentacles white at base, gray or blackish in the middle and at the tip. Blackish spots are generally seen on the neck and sides, rarely are these portions completely black. The mantle has a blackish margin. Head with oblique wrinkles. Eyes located on the outer posterior base of the tentacle."

Specimens examined. ORIENTE. Cabo Cruz; Ojo del Toro, Sierra Maestra; Pico Turquino; S side of Pico Turquino; Subido

a Pico Turquino; Buenavista, Bayamo; El Jaquey; La Lechuza, Monte Toro, Guantánamo; La Caridad, Monte Toro, Guantánamo; Cafetal "Virginia," Yateras, Guantánamo; Yateras, Guantánamo (US NM); La Cubana, Yateras, Guantánamo; Monte Líbano, Guantánamo; Hoyo de Julian, Rio Guaso, Guantánamo (ANSP); Loma del Gato, Songo; Yunque de Baracoa (MCZ).

***Alcadia (Idesa) concinna* (Pfeiffer)**

Plate 1, figures 10–12; Map 2

Helicina concinna "Gundlach" Pfeiffer, 1857. Malak. Blät., 4: 178 (type-locality, Cabo Cruz, Oriente; specimen here figured, MCZ 86616, Boston Soc. Nat. Hist. Collection ex Gundlach). Pfeiffer, 1858, Monographia Pneumonopomorum Viventium, suppl. 1, p. 194. Sowerby, 1866, Thes. Conchyl., 3: 287, pl. 6 (271), figs. 229–230. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 51. Crosse, 1890, Jour. de Conchyl., 38: 318.

Helicina exserta "Gundlach" Pfeiffer, 1858. Malak. Blät., 5: 194 (type-locality, Santiago de Cuba; type destroyed). Pfeiffer, 1865, Monographia Pneumonopomorum Viventium, suppl. 2, p. 288, non Martens, 1891. Crosse, 1890, Jour. de Conchyl., 38: 319.

Helicina exserta Gundlach. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 51 (error for *exserta*).

Alcadia (Leicalcadia) concinna (Pfeiffer). Wagner, 1907, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 72, pl. 12, figs. 15–18.

Description. Shell reaching about 6 mm in width, 5 mm in height, globose-conic, rather solid, lustrous. Whorls $5\frac{1}{2}$, weakly convex, increasing slowly in width. Body whorl about twice as wide as penultimate, moderately inflated, well rounded, descending at aperture; base weakly inflated. Color white, yellowish or very pale reddish, occasionally ornamented with darker reddish sutural band, spire frequently darker than body whorl, basal callus and aperture frequently yellow. Aperture oblique, semi-lunate, well rounded peripherally and constricted at the peristome. Palatal lip entire, barely expanded, with shallow, very wide, rounded basal sinus; denticle upwardly directed, squarish but rounded at

upper portion. Basal callus yellowish or white, finely granulate, weakly delimited parietally, with rather deep, unevenly curved groove at umbilical margin. Columella evenly sigmoid, widely rounded below and terminating in basal tooth. Suture strongly impressed, subcanaliculate at summit of body whorl. Sculpture of rather weak, irregular, diagonal growth lines occasionally with spiral striae on upper whorls. White lineolations within shell substance very narrow, more or less regularly spaced, weakly sinuous. Protoconch $1\frac{1}{2}$ whorls, rounded, minutely granulate, little raised above succeeding whorls. Periostracum deciduous, pale horn colored, very thin. Operculum as in genus, pale horn colored, rather darker at outer margin.

height in mm	width in mm	
5.1	6.0	Cabo Cruz at the Lighthouse
4.2	5.6	Cabo Cruz
4.1	5.0	Cabo Cruz

Remarks. The shell of this species can be recognized by its conic-globose outline, solid substance, sublustrous surface, extremely narrowly expanded lip, and constricted aperture.

The species *H. exserta* Pfeiffer from near Santiago de Cuba is said to differ from *concinna* in its larger size and the presence of spiral lirations on the upper whorls. Since the size of the specimens of *concinna* from near the lighthouse were larger than those from elsewhere on the cape, and since spiral lirations are a variable feature in the Helicinidae, we have decided to consider *exserta* as a junior synonym. The species was probably introduced into Cuba from the neighboring Antilles.

Pfeiffer (1858: 194) transcribed Gundlach's notes on the animal of *exserta*, which we translate as follows: "Animal with black head, neck and tentacles, the latter somewhat lighter near the tip. Foot white with a gray sheen on the rugosities of the surface."

The species lives on trees and bushes

and, according to Gundlach, under loose bark among orchid leaves.

Specimens examined. ORIENTE. Four to five km E of Ensenada de Mora (ANSP); Santiago on Shore Road, 10 km E of Ensenada de Mora (ANSP); Punta Icaca (Hicaca) near Cabo Cruz (USNM); Lighthouse at Cabo Cruz; Puerto Portillo, Cabo Cruz; Hill W of Toro River near Cabo Cruz (ANSP); Mouth of Río Puerco near Cabo Cruz (ANSP); Río Ojo del Toro (ANSP).

Subgenus *Hjalmarsona* H. B. Baker

Hjalmarsona H. B. Baker, 1940. Nautilus, 54: 70; type-species, *Alcadia* (*Idesa*) *hjalmarsona* (Pfeiffer) 1856 [from Puerto Rico], original designation.

Description. "Shell smooth and shining with rapid whorl-increase and large aperture; peristome scarcely reflected and only weakly thickened internally, columella weakly convex and scarcely thickened. Calcareous plate of operculum thin but well developed, granulate externally; columellar margin sigmoid." (H. B. Baker)

Remarks. *Hjalmarsona* is a subgenus which embraces the smaller, fragile, comparatively drably colored, depressed globose forms of *Alcadia* s.l. which have a rather weak development of the basal sinus and tubercle and lack a hirsute or pilose periostracum. Previous authors put these species in *Idesa* from which they differ by being more fragile, less elevated and more drab. They differ from *Penisoltia* which they resemble in color, fragility of the shell, and occasionally in habitat, by the possession of a glossy, persistent periostracum instead of a hirsute, deciduous one. They live either on bushes (Arango, 1879) or under rocks and dead leaves.

KEY TO SUBGENUS *Hjalmarsona*

1. Shell generally 9–11 mm wide, basal tooth and sinus barely visible; distribution limited to eastern Oriente Province *neebiana*
Shell rarely reaching 10 mm, most often smaller, basal sinus wide, shallow, basal tooth small but distinct; distribution from Pinar del Río to Matanzas *nitida*

Alcacia (Hjalmarsona) neebiana
(Pfeiffer)

Plate 2, figures 1–3; Map 2

Helicina neebiana Pfeiffer, 1862. Malak. Blät., 9: 8 (type-locality, Cayo del Rey, Mayarí, Oriente [Wright leg.]; type destroyed; specimen here figured, MCZ 90056, T. Bland Collection). Pfeiffer, 1865, Monographia Pneumonoporum Viventium, suppl. 2, p. 225. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 51. Crosse, 1890, Jour. de Conchyl., 38: 318.

Alcacia (Leialcacia) neebiana (Pfeiffer). Wagner, 1907, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 67, pl. 10, figs. 21–25.

Alcacia (Hjalmarsona) selenipoma Aguayo and Jaume, 1958. Mem. Soc. Cubana Hist. Nat., 24: 93, pl. 1, fig. 7 (type-locality, La Vega, Canapú, Mayarí, Oriente, Cuba; holotype, MP 17433).

Description. Shell reaching about 10.7 mm in width, 8.2 mm in height, subglobose, smooth, glossy, moderately strong. Whorls 5, moderately convex, slowly increasing in width. Body whorl almost 3 times wider than penultimate, inflated, well-rounded, descending little at aperture; base moderately inflated. Color brownish yellow, spire occasionally pale orange and darker than rest of shell; basal callus and palatal lip white. Aperture moderately oblique, semilunate, evenly rounded, not flattened above. Palatal lip slightly thickened, weakly expanded, barely extended above, straight or slightly bent outward at insertion in body whorl, basal notch exceedingly shallow. Columella oblique, almost straight above, slightly rounded below, separated by narrow groove from the basal callus and terminating in very low, white, rounded tubercle. Basal callus subcircular, lustrous, white, indistinctly delimited, not raised, very finely granulate, contrasting well with axial sculpture of rest of base. Suture moderately impressed, occasionally bounded by narrow white band, becoming obsolete near aperture. Sculpture of barely perceptible growth lines, stronger on base; surface very finely punctate. White lineolations within shell substance narrowly separated, weakly sinuous, occasionally vermiculate. Proto-

conch almost 2 whorls, translucent, rounded, surface finely and regularly punctate, very slightly raised above succeeding whorls. Periostracum thin, glossy, strong. Operculum as in genus, pale brownish yellow, with dark, reddish brown outer margin. Occasional populations with heavy, white, opaque, wrinkled, semilunate deposit covering upper $\frac{2}{3}$ of external surface and reaching from near outer margin to $\frac{3}{4}$ of way to inner.

height in mm	width in mm	
8.2	10.7	La Cantera de Miranda, Oriente
8.2	9.6	La Vega, Canapú, Mayarí
7.2	10.5	La Cantera de Miranda, Oriente
6.0	7.7	La Vega, Canapú, Mayarí

Remarks. This species can be recognized by the glossy, brownish yellow surface, the subglobose outline, and the very weak development of the basal tubercle and notch. It has been reported only from the municipio of Mayarí in north-central Oriente.

Aguayo and Jaume (1958) gave the name *selenipoma* to a population of smaller shells from Canapú on the basis of the peculiar opaque layer on the exterior of the operculum. However, we found the identical layer in a series of typically sized *neebiana* from Miranda, Mayarí (MCZ 276643). This characteristic seems to be caused by some unknown factor in the environment and deserves more study. The other differences cited for distinguishing *selenipoma* from *neebiana*, such as size, texture, and color, are variable and do not merit specific distinction.

Specimens examined. ORIENTE: Mayarí: [Cayo del Rey] La Cantera de Miranda; Cayo del Rey, about 20 mi. from Miranda (ANSP); hill N of Mercedes Valley, Miranda (ANSP); upper Mercedes Valley (ANSP); La Vega, Canapú; N of Imias, 3,000 to 4,000 ft.; Cuchillo de Guajimero, 2,000 ft.

***Alcadia* (Hjalmarsona) *nitida* (Pfeiffer)**Plate 3, figures 7–9; figures 10–12;
Map 2

Helicina nitida Pfeiffer, 1839. Arch. Naturg., 5th year, vol. 1, p. 355 (Cuba; type-locality, here selected, El Descanso, Coliseo, Matanzas; type destroyed). Sowerby, 1847, Thes. Conchyl., 1: 13, pl. 3, fig. 116. Pfeiffer, 1850, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 1, p. 25, pl. 4, figs. 19–21; 1852, Monographia Pneumonoporum Viventium, p. 356. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 46. Crosse, 1890, Jour. de Conchyl., 38: 312.

Helicina glabra Gould, 1842. Boston Jour. Nat. Hist., vol. 4, no. 1, on back cover; 1842, Proc. Boston Soc. Nat. Hist., 1: 138 (type-locality, Cuba; lectotype, selected by Johnson, 1964, p. 83, pl. 41, fig. 2, MCZ 169172). Pfeiffer, 1856, Malak. Blät., 3: 145; 1858, Monographia Pneumonoporum Viventium, Suppl. 1, p. 188. Poey, 1858, Memorias Historia Natural Isla de Cuba, 2: 67, pl. 7, fig. 15. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 46. Crosse, 1890, Jour. de Conchyl., 38: 312.

Helicina nitida var. *elatii* Pfeiffer, 1856. Malak. Blät., 3: 145 (type-locality, here selected, Marianao, Havana, Cuba; type destroyed; specimen here figured, pl. 3, figs. 10–12, MCZ 47511, Marianao, Bermúdez leg).

Alcadia (*Leialcadia*) *nitida* (Pfeiffer). Wagner, 1907, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 68, pl. 11, figs. 5–8.

Alcadia (*Leialcadia*) *rotunda glabra* (Gould). Wagner, 1907, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 2, p. 70, pl. 11, figs. 15–18.

Alcadia elatii (Pfeiffer). Aguayo and Jaume, 1939, Mem. Soc. Cubana Hist. Nat., 13: 238. Aguayo, 1949, Rev. Soc. Mal. 'Carlos de la Torre,' 6: 97.

Alcadia (*Alcadia*) *elatii* Pfeiffer. Aguayo and Jaume, 1953, Mem. Soc. Cubana Hist. Nat., 21: 271, pl. 31 [not 32], fig. 3.

Alcadia (*Ideas*) *nitida* (Pfeiffer). Farfante, 1942, Mem. Soc. Cubana Hist. Nat., 16: 50.

Description. Shell reaching about 10 mm in width, 7 mm in height, depressed globose, sublustrous, rather fragile, smooth. Whorls almost 6, weakly inflated, increasing regularly and rather rapidly in width. Body whorl about twice the width of penultimate, rounded, descending slightly at the aperture, base weakly inflated. Color white or various shades of pale brown, spire occa-

sionally darker. Aperture rounded triangular, moderately oblique, internally same color as shell. Palatal lip thin, very weakly flaring, not reflected, slightly depressed and sigmoid above, curved at upper insertion in body whorl with distinct, V-shaped, rather deep notch; rounded sinus at base of columellar process. Basal callus white or very pale brown, minutely granulate, weakly delimited parietally, and by shallow, unevenly semicircular groove in umbilical region. Columella weakly concave, terminating in short, variously rounded peduncle and raised below, forming low, vertical wall above umbilical groove. Suture weakly impressed. Sculpture of weak, irregular growth lines only; white, axial lineolations within shell substance quite narrow, weakly sinuous, separated by rather wide, regular intervals. Protoconch 1½ whorls, rounded, densely granulate, very slightly raised above succeeding whorls. Periostracum wanting. Operculum as in genus, horn colored.

height in mm	width in mm
7.4	10.2
7.1	9.6
6.8	9.5
6.6	8.9
5.4	7.5
5.3	8.0

La Majagua, Luis Lazo, Pinar del Río
Hoyo de los Cidros, El Queque, Viñales, Pinar del Río
El Descanso, Coliseo, Matanzas
Camoá, Habana
El Palenque, Matanzas
Mogote La Curva, Madruga, Habana

Remarks. The shells of this species resemble those of *A. rotunda* but differ in their more depressed outline, in their more subdued color, and in the somewhat stronger basal tooth and sinus. They differ from *dissimulans* in their smaller size, the shallower basal sinus, and in the straight instead of curved upper labial insertion in the body whorl.

The species is found in humid earth and under rocks (Farfante, 1942: 50) and lives in calcareous areas in the lowlands as well as on hills. It ranges from the eastern half

of Pinar del Río through Habana to the central portions of Matanzas. The range overlaps that of *rotunda* only in Pinar del Río. Since their ecological requirements differ—*rotunda* being arboreal—they are found in the same localities, *i.e.*, at El Queque in Viñales and probably elsewhere. In Habana and Matanzas the range overlaps that of *A. hispida*, which, however, continues into Las Villas, where *nitida* does not occur.

Pilsbry collected a series of three imperfect, dead specimens near Florencia in Camagüey (ANSP 148592) and a similar series from Mota in Oriente (ANSP 148669), which seem to be referable to *nitida*. However, both these lots lie far to the east of the range of *nitida* as we are led to understand it on the basis of most specimens available for our examination. Whether *nitida* does indeed range as far to the east as these two series seem to indicate remains to be decided by further collecting in the two easternmost provinces of the island.

The shells vary somewhat in size, the population from San Antonio de los Baños in Habana Province being small, while those around Luis Lazo are larger. However, there is no clinal variation, since shells almost as large are also found in Coliseo, Matanzas.

Pfeiffer (1856: 144) transcribed Gundlach's notes on the animal which we translate as follows: "Animal whitish, with gray dots above. Tentacles blackish, lighter at tip. The animal in the shell, which is always clean, sometimes of one color, sometimes spotted."

The nomen *elatio*r Pfeiffer has had a unique history, well related in its entirety by Aguayo (1949). Pfeiffer (1856) described it briefly in a note about *Helicina glabra* Gould but did make two essential points, namely that the peristome (Mundsaum) was not "bogig" or curved above and hence did not form an acute angle at the upper insertion, and that the peristome projected below. As Aguayo pointed out

(1949), this may be an insufficient description for taxonomic purposes. Moreover, it can be seen that Pfeiffer did not consider this to be a formal indication, since he omitted it from all the editions of his *Monographia Pneumonopomorum Viventium* (1858, 1865, 1876). Yet the fact remains that Pfeiffer's indication was so clear as to enable Aguayo and Jaume to recognize the taxon in 1939. It was more fully described in 1939, but a full, formal description was given by Aguayo in 1949. Aguayo and Jaume (1953) recorded it from Loma Cantera Blanca in the region of Baracoa. However, we found the characteristics mentioned by Aguayo and Jaume in specimens in other populations of *nitida* and do not accord it a separate status.

Specimens examined. PINAR DEL RÍO. Mendoza; Hoyo de la Cueva, La Majagua, Luis Lazo; Ensenada de Fuentes, Valle de San Carlos, Luis Lazo; El Queque; Hoyo de los Cidros, El Queque; Mogote de la Dinamita, Viñales; Mogote José Mariá García, Palmarito, Viñales; Palmarito; Costanera de San Vicente; Los Paredones, Ceiba del Agua. HABANA. San Antonio de los Baños; Santiago de las Vegas; 1 km from Bejucal; Sitio Perdido, Jaruco (USNM); Camoa near Jamaica; Somorrostro near Jamaica; Marianao. *Madruga*: Mogote Finca Almeida, Pipián; Lafut, Pipián; E end of Sierra El Grillo; E of Zanabria; Mogote la Curva. Cojimar; Loma de Coco; Central Merceditas. MATANZAS. Abra del Yumurí; Mena, Yumurí; Riscos Calderón, 5 km W of Ceiba Mocha; Mogote de Ceiba Mocha; Ceiba Mocha (USNM); Pan de Matanzas (USNM); paredones E of pass, Coliseo (USNM); El Descanso, Coliseo; paredones N of San Miguel de los Baños (USNM); mogote opposite side of road from Mogote Caoba, between Coliseo and San Miguel de los Baños; Loma Odiseo between Coliseo and San Miguel de los Baños (USNM); Vista Alegre (USNM); paredones 2 km S of Limonar; Palenque de Matanzas (USNM); El Palenque; Finca el Pan, Pan de Palenque (USNM); right bank below

ferry, Canímar R., El Fundador (USNM); right side of river, El Fundador (USNM).

Subgenus *Penisoltia* H. B. Baker

Hispida Wagner, 1907. In Martini and Chemnitz, Conchyl.-Cab., 2 (1): sect. 18, pt. 2, p. 54 (type-species, *Helicina hispida* Pfeiffer, 1839, by tautonymy, see H. B. Baker, 1922, p. 46, non Bate 1868 [Porifera]).

Penisoltia Baker, 1954. Nautilus, 67: 139, new name for *Hispida* Wagner, 1907, non Bate, 1868.

Description. Shell medium sized (11 × 7 mm) to small (5 × 4 mm), generally depressed globose, brown or faint reddish brown or white, generally fragile. Operculum usually thin, calcareous layer thin, chitinous layer filmy. Periostracum pilose or hirsute, hairs at times arranged in spiral rows, deciduous. The basal sinus and tubercle are generally well developed.

Remarks. The species of this subgenus differ from *Alcadia* s. s. in being generally smaller and more depressed. The shell is more fragile and the development of the basal sinus and tubercle is stronger. We are placing in this subgenus all the smaller, ground-dwelling, fragile, and generally colorless forms having a highly deciduous periostracum.

Penisoltia (and *Hispida* Wagner, 1907) really have never been described (see p. 313). We believe the subgenus should be separated from *Alcadia* for the reasons given above.

KEY TO THE SPECIES OF *Penisoltia*

1. Shell small, 4.5 to 7 mm in width 2
Shell larger, 7 to 11 mm in width 3
2. Shell 5 to 7 mm wide, basal sinus narrow, deep, outline depressed; distribution from Habana to Las Villas Province and Isle of Pines *hispida*
Shell 4 to 5 mm wide, basal sinus shallow, U-shaped; distribution island-wide except Isle of Pines *minima*
3. Periostracum generally covering entire shell 4
Periostracum generally arranged in spiral ridges 5
4. Periostracal hairs deciduous, reflected on surface by minute pits arranged in spiral rows; distribution in eastern Cuba in Las Villas and Oriente *gonostoma*
Periostracal hairs not reflected by pits; dis-

tribution in western Pinar del Río Province only *dissimulans*

5. Basal channel pronounced, basal tooth narrow; distribution limited to Las Villas Province and border of Camagüey *bermudezi*
Basal channel weaker, basal tooth wide; distribution limited to Pinar del Río Province *velutina*

Alcadia (*Penisoltia*) *hispida* (Pfeiffer) Plate 4, figures 13–15; Map 3

Helicina hispida Pfeiffer, 1839. Arch Naturg., 5th year, 1: 355 (Cuba, type-locality, subsequently designated by A. Torre, 1952, Cafetal Fundador de Canimar, Matanzas; type destroyed); 1850, in Martini and Chemnitz, Conchyl.-Cab., (2) 1: sect. 18, pt. 1, p. 30, pl. 3, figs. 19–22. Sowerby, 1842, Thes. Conchyl., 1: 4, pl. 3, figs. 112–113; 1866, Thes. Conchyl., 3: 279, pl. 1 (266), figs. 33–34. Gould, 1843, Boston Jour. Nat. Hist., 4: 493.

Helicina dentigera Orbigny, 1842. Mollusques, in Sagra, Histoire Physique, Politique et Naturelle de l'Île de Cuba, 1: 252, pl. 21, figs. 4–6 ("interieur de Cuba"; type in BMNH). Sowerby, 1842, Thes. Conchyl., 1: 4, pl. 3, figs. 107–108. Pfeiffer, 1850, in Martini and Chemnitz, Conchyl.-Cab. (2) 1: sect. 18, pt. 1, p. 30 (in synonymy of *hispida*).

Alcadia hispida (Pfeiffer). Pfeiffer, 1852, Monographia Pneumonopomorum Viventium, p. 412; 1856, Malak. Blät., 3: 150. Arango, 1879, Contribución Fauna Malacológica Cubana, p. 57. Crosse, 1890, Jour. de Conchyl., 38: 325. A. Torre, 1952, Rev. Soc. Malac. 'Carlos de la Torre,' 9: 14.

Alcadia (*Eualcadia*) *hispida* Pfeiffer. Wagner, 1907, in Martini and Chemnitz, Conchyl.-Cab., 2 (1): sect. 18, pt. 2, p. 55, pl. 8, figs. 8–12.
Alcadia (*Alcadia*) *hispida* (Pfeiffer). Farfante, 1942, Mem. Soc. Cubana Hist. Nat., 16: 50.

Description. Shell reaching about 7 mm in width and 5 mm in height, globose-depressed, fragile, moderately lustrous under pilose periostracum. Whorls about 5½, moderately convex, increasing regularly in width. Body whorl 1½ times wider than the penultimate, well rounded peripherally, descending slightly at aperture. Color under periostracum varied: pale yellow, pale reddish brown, buff, or bluish white; lip and basal callus generally lighter than rest of shell. Aperture semilunate, evenly rounded centrally, straight and flattened above, rounded below. Palatal lip thin, gently expanded except at terminations,

flattened and weakly sigmoid above, not curved at insertion into body whorl; basal sinus deep, narrow, rounded below. Basal callus slightly inflated, glassy, surface minutely granulate, indistinctly delimited parietally, set off in umbilical area by well-impressed, curved, rather wide groove. Umbilical margin of base of body whorl with low, curved lamella terminating in high, curved, rounded tooth with raised, drop-shaped thickening on distal inner margin. Columella oblique and weakly convex above, slightly curved and directed forward below, terminating in tooth. Suture well impressed, subcanalicate near aperture. Sculpture of irregular, weakly developed, diagonal growth lines, stronger on base, crossed by very finely impressed, closely set, occasionally interrupted spiral furrows, forming irregularly decussated surface. Lineolations inside shell substance threadlike, weakly sinuous. Protoconch $1\frac{1}{2}$ whorls, glassy, transparent, rounded, finely punctate, slightly raised above succeeding whorls. Periostracum strong, deciduous, closely pilose, brown or reddish brown, covering entire shell except protoconch and region of basal callus. Operculum as in genus, calcareous layer glassy, finely granulate; chitinous layer white but pale brown at outer margin, strongly extended beyond calcareous layer, especially so at columellar edge; internal wedge-shaped lamellae at columellar edge well developed.

height in mm	width in mm	
4.7	6.9	Mogote at Km 70, Sierra Grillo, Madruga, Habana
4.7	6.5	Guabaira, Soledad, Cienfuegos, Las Villas
4.5	6.8	Sierra de San Juan de La Mar, Isle of Pines
3.3	5.7	Bridge over Canímar River near Matanzas, Matanzas

Remarks. The shell of this species somewhat resembles that of *Alcadia minima* Orbigny, but besides its consistently larger size, *A. hispida* also differs in the stronger expansion of the palatal lip, the relatively

deeper and narrower basal sinus, the stronger development of the curved basal groove, the presence of spiral sculpture and the relatively more depressed outline. Even where the two approach each other in size—though *hispida* will always be the larger—the higher outline of *minima* sets it off immediately. Superficially, Orbigny (1842) seems to be right when he wrote of *minima*, “Cette coquille nous représente en petit la forme de *dentiger* [= *hispida*].” Both are found under similar ecological conditions. The rather heavy brown periostracum probably serves to disguise *hispida*, which is found under rocks (Arango, 1879) and under leaves in forests and on limestone knobs, preferring calcareous soil (Gould, 1844). Pfeiffer (1856: 150) reported it in foliage and moss. He also transcribed Gundlach’s notes on the animal, which we translate as follows: “Animal whitish. Fine, blackish dots make the head appear gray. Tentacles blackish.”

The range of *hispida* is much more restricted than that of its smaller congener, extending only from Pinar del Río to Las Villas, but also occurring on the Isle of Pines, whereas *minima* is found everywhere on the island, except on the Isle of Pines.

Specimens examined. PINAR DEL RÍO. Mogote de La Jagua, Viñales; Mogote Kilometer 14; E of Mogote Trujillo, Viñales; Mogote de Rojero between Cayos de San Felipe and Loma de Isabel María. HABANA. San Antonio de los Baños (USNM); Sitio Bonillo, Jaruco (USNM); Sitio Perdido, Jaruco. *Madruga*: Mogote La Curva; Abra del Café, Sierra El Grillo; E end of Sierra El Grillo; mogote at km 70, Sierra El Grillo; Paredones Entronque, Sierra El Grillo. Camoa near Jamaica; Central Merceditas; 1 km from Bejucal; Cojimar; Managua. MATANZAS. Stone fence at top of road leading to Bellamar Caves (USNM); Playa Bellamar; 10 km from Matanzas on road to Cárdenas; 6 km W of Ceiba Mocha; El Fundador, Canimar; E bank of Río Canimar, NW of Fundador (USNM); Bridge

over Río Canímar on Matanzas–Limón road; Finca Castillito, Río Canímar; paredones E of the pass, Coliseo (USNM); stone fence between Coliseo and Matanzas (USNM); Abra Yumurí; Finca Montecristo, SE of Limón; sierra S of Martí or Hato Nueva. *Las Villas*: paredones at Finca Santa Theodora, E of Coralillo (USNM); top of mogote W of Coralillo (USNM); Hornos de Cal, Sancti Spiritus; Loma El Ternero, San Juan de los Yeras; mogotes at Junagua, near Sagua La Grande; Central Ramona, S side of reservoir (USNM). *Soledad, Cienfuegos*: Vilches Potrero; Seboruco near Guaos, 2 miles N of Soledad; Guabairo; Limones Seboruco 1 mi. SE of Soledad; Harvard House; Limones; Palm Grove, 1½ mi. SE of Soledad. *ISLE OF PINES*. Sierra de Casas; Sierra de Bibijagua; Mina Carlota, Sierra de San Juan; Sierra de San Juan de la Mar.

***Alcaldia (Penisoltia) bermudezi bermudezi* Aguayo and Jaume**
Plate 4, figures 10–12; Map 3

Alcaldia bermudezi Aguayo and Jaume, 1957. Mem. Soc. Cubana Hist. Nat., 23: 121, pl. 1, figs. 1–3 (type-locality, “La Sierra” Vega Alta, Provincia de Las Villas, Cuba; holotype, MP 17391; paratypes, MCZ 128665).

Description. Shell reaching about 11 mm in width, 6.5 mm in height, strongly depressed, roundly carinate, sublustrous under thin periostracum, rather fragile, translucent. Whorls 5¾, upper ones almost flat, body whorl convex; whorls increase rapidly in width. Body whorl about 2½ times wider than penultimate, convex above, roundly carinate, descending slightly at aperture, base moderately inflated. Color pale lemon or brownish yellow, basal callus and peristome white. Aperture quite oblique, widely semilunate, well rounded peripherally, somewhat depressed and straight above. Palatal lip thin, well expanded except at both terminations, slightly sigmoid near upper insertion, with deep, roundly V-shaped, somewhat forward directed basal sinus above basal tooth. Basal callus glassy, granulate, indistinctly

delimited parietally, bordered in umbilical region by curved, rapidly widening, rounded groove. Strong, pointed, forward directed tubercle rising from low, marginal lamella on umbilical edge of basal callus. Columella oblique, sigmoid above, sharply but regularly rounded, terminating in basal tooth. Suture well impressed, subcanaliculate on approach to aperture. Sculpture of rather strong, irregular, curved diagonal growth lines, weakly decussated by numerous shallow spiral striae, most noticeable on penultimate whorl, obsolete on body whorl; lineolations within shell substance white, narrowly separated, weakly sinuous. Protoconch 1.0 whorl, rounded, minutely punctate and with series of weak, irregular, rounded axial cords. Periostracum weak, deciduous, with long, pointed hairs thickly arranged in 4 spiral bands on base and generally one on periphery. Operculum as in genus, yellowish brown, dark reddish brown at outer margin; internal wedge-shaped lamella weakly developed.

height in mm	width in mm	
6.4	11.0	La Sierra, Vega Alta, Las Villas
6.3	10.6	El Purio, Calabazar de Sagua
5.7	9.9	La Sierra, Vega Alta, Las Villas
5.4	9.2	El Purio, Calabazar de Sagua

Remarks. This species is readily recognized by its depressed outline, comparatively large size, strongly expanded peristome, forward directed, rounded basal tooth and, in life, by the presence of narrow, thick, hirsute, brownish spiral periostracal ridges. These hairs are very brittle and easily broken off. This species appears to be closest to *A. velutina* from which it differs in color, in the nature of the periostracum, and in the fact that in *velutina* the basal tooth is noticeably longer and wider.

The species is limited to a restricted area in the north-central part of Las Villas Province in the vicinity of Calabazar de Sagua.

Specimens examined. LAS VILLAS. La Sierra, Vega Alta (MCZ); mogote near Lomo Chicharrón near Vega Alta; second mogote of La Sierra, near Vega Alta; pare-

dones of Finca el Mirador near Calabazar; mogote Mirador near Calabazar; paredones of Mogote Cueva Galana near Calabazar; Loma Batey, Ingenio Santa Clara, 6 km NW of Calabazar; Cueva Galana, Calabazar; El Purio, Calabazar; Loma del Purio, W side of Central Purio; loma W of Loma del Purio. W side of Central Purio; Loma Santa Clararita, S end of Central Purio (all USNM).

***Alcadia (Penisoltia) bermudezi jatibonica* Boss and Jacobson new subspecies**

Plate 5, figures 4–6; Map 3

Holotype, MCZ 128669, Boquerón de Jatibonico, Las Villas. Paratypes, MCZ 276631, same locality; MCZ 128671, Loma Espinosa, Chambas, Camagüey; MCZ 128670, La Vigía, Mayajigua, Las Villas.

Description. The shells of this subspecies resemble those of the nominate subspecies in the depressed, roundly carinate outline and in the structure of the basal sinus and tooth. However, it is consistently smaller, the color is white rather than yellow or pale reddish brown, and the palatal lip proportionately less widely expanded. The periostracum is stronger and more pilose and the spiral hirsute bands less conspicuous and fewer in number. Operculum as in nominate subspecies.

height in mm	width in mm	
5.5	8.2	Holotype, Boquerón de Jatibonico, Las Villas
5.3	8.3	Paratype, Loma Espinosa, Chambas, Camagüey
4.9	8.3	Paratype, La Vigía, Mayajigua, Las Villas

Remarks. The differences between the new subspecies and the nominate subspecies serve to separate them. The range of *bermudezi bermudezi* is centered about Calabazar de Sagua in the north central region of Las Villas Province, whereas *b. jatibonica* occurs between Mayajigua, Las Villas and Chambas, Camagüey, from the

northeast corner of Las Villas to the adjacent northwest corner of Camagüey.

Specimens examined. Holotype and paratypes.

***Alcadia (Penisoltia) dissimulans* (Poey)**
Plate 4, figures 7–9; Map 3

Helicina dissimulans Poey, 1857. *Memorias Historia Natural Isla de Cuba*, 2: 35, pl. 4, figs. 8–10 (not 8–9 only as in text) (type-locality, Guane, Pinar del Río; type probably in MP). Sowerby, 1866, *Thes. Conchyl.*, 3: 279, pl. 1 (266), figs. 28–29.

Alcadia dissimulans Poey. Pfeiffer, 1858, *Malak. Blät.*, 5: 5; 1858, *Monographia Pneumonomorum Viventium*, suppl. 1, 223. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 56. Crosse, 1890, *Jour. de Conchyl.*, 38: 325.

Alcadia (Eualcadia) dissimulans Poey. Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 55, pl. 8, figs. 4–7, 24.

Alcadia dissimularis "Poey" Richards, 1933. *Proc. Pennsylvania Acad. Sci.*, 7: 168 (error for *dissimulans*).

Description. Shell reaching about 11 mm in width, about 8 mm in height, strongly depressed, globose, rather fragile, sublustrous under pilose periostracum, subcarinate. Whorls about 5½, earlier whorls quite flat, later ones weakly rounded, increasing regularly in width. Body whorl 1½ times width of penultimate, weakly carinate, barely descending at aperture; base moderately inflated. Color various, pale reddish brown, pale buff, yellowish white, white or gray under the periostracum; basal callus and lip generally lighter in color than rest of shell. Aperture oblique, roundly triangular, almost straight below, noticeably depressed and flattened above. Palatal lip narrow, thin, weakly expanded centrally, depressed and weakly sigmoid above, somewhat raised below, with shallow, V-shaped sinus before basal tooth. Basal callus glossy, very weakly granulate, indistinctly limited parietally, set off in umbilical region by very shallow, slightly curved groove. Low, rounded and curved lamella near insertion in columellar termination. Columella strongly sloping and weakly inflated above, almost straight, directed outward below, and terminating in

low, blunt outwardly directed tooth. Suture moderately impressed. Sculpture of irregular, moderately strong, shallowly curved, diagonal growth lines. Lineolations within shell substance very fine, closely spaced, weakly sinuous, most noticeable on base. Protoconch $1\frac{1}{2}$ whorls, glassy, rounded, minutely punctate, same color as rest of shell, slightly raised above succeeding whorls. Periostracum pilose, deciduous, thin, hairs not arranged in any pattern, absent from area of basal callus and protoconch. Operculum as in genus, thin, pale yellowish brown with outer margin darker orange-brown. Internal wedge-shaped lamellae on columellar edge moderately well developed.

height in mm	width in mm	
7.8	10.6	El Queque, Viñales
7.3	10.4	Isabel María
6.7	10.3	Cabezas
6.6	9.3	El Queque, Viñales
6.4	11.3	Cabezas
6.3	8.3	Isabel María

Remarks. The shells of this species superficially resemble those of *velutina* but differ in having a less strongly developed basal peduncle, notch, and callus groove. The palatal lip is more widely expanded and more strongly depressed above. *A. dissimulans* is distinguished from *nitida* by having the upper lip straight at the insertion into the body whorl; in *nitida* this is curved and forms a shallow notch. In addition *dissimulans* is larger than *nitida* and differs in the nature of the basal tooth, which is narrower in *nitida* and is preceded by a much shallower palatal sinus.

In the MCZ collection we were able to examine some 37 lots of *dissimulans*. All of the more recently collected and more exactly localized series come from an area reaching from Cabezas and Isabel María to Viñales, about 45 kilometers from Guane, which was given by Poey as the type-locality. Guane is also the type-locality of *velutina* and the possibility cannot be overlooked that Poey erred as far as localizing

dissimulans is concerned. The older published records all give Guane as the type-locality, but this undoubtedly is the result of copying from Poey. One lot in MCZ (72463, H. G. Richards leg.) from the "Sierra de Mendoza" (probably Sierra Guane or Sierra Paso Real) bore the label *dissimulans* but upon examination it proved to be typical *velutina*. We believe that the true type-locality of *dissimulans* is further to the northeast around Isabel María, Viñales.

Specimens examined. PINAR DEL RÍO. *Guane*: Sierra Paso Real; north base of Sierra de Guane (USNM); caves in mogote south side of road opposite Sierra Guane; Sierra Guane; Los Portales (USNM); La Muralla (USNM); Luis Lazo; El Potrero, Luis Lazo; ensenada in Sierra San Carlos opposite south end of Sierra de Los Acostas, Luis Lazo (USNM); Sumidero (USNM); Isabel María; Cabezas. *San Vicente*: Costanera del Abra (USNM); La Chorrera; north part of Sierra La Chorrera; Ensenada de los Baños (USNM); Mogote Ensenada de San Vicente; Ancón; Mogote Pequeño, Costanera de San Vicente. *Viñales*: Puerta del Ancón; Hoyo del Majagual, Sierra del Ancón; Sierra de Viñales; Sitio del Infierno; Hoyo de Los Cimarrones, peak of Sierra del Infierno; Sierra del Infierno; Rinconada de la Sierra Serrucho; Cafetal de la Penitencia; Pan de Azúcar; La Guasasa; Ensenada Miranda, Palmarito; Mogote Palmarito; Hoyo de Junes, Palmarito; Mogote Millo, Ensenada de la Grilla; Mogote Capón; Las Puntas; El Guamá; Las Delicias; El Queque; El Descanso; Mogote del Rojero; between Cayos de San Felipe and Loma de Isabel María; mogotes at Kilometer 14; Santo Tomás; Mogote Dinamita (USNM); Los Hermanos (USNM); Mogote de la Vega (USNM); Mogote de la Mina (USNM); Mogote Martín Miranda; Mogote San Felipe (USNM); Guajamí (USNM). Sitio de la Sierra, San Andrés; Sierra de San Andrés; Pan de Guajabón (USNM); Mogote La Finca, San Diego de los Baños; La Güira, San Diego de los Baños; Río Dominica, 10 mi. W of Mariel.

***Alcadia (Penisoltia) gonostoma* (Poey)**
Plate 5, figures 1–3; Map 3

Helicina gonostoma "Gundlach" Poey, 1858, *Memorias Historia Natural Isla de Cuba*, 2: 87 (type-locality, San Juan de Letrán, Trinidad, Las Villas, Cuba; types probably in MP).

Alcadia gonostoma Gundlach. Pfeiffer, 1858, *Malak. Blät.*, 5: 194; 1865, *Monographia Pneumonomoporum Viventium*, suppl. 2, p. 248. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 56. Crosse, 1890, *Jour. de Conchyl.*, 38: 325.

Helicina gonostoma Poey. Sowerby, 1866, *Thes. Conchyl.*, 3: 297, 299, error for *gonostoma*.

Alcadia (Alcadia) gonostoma (Gundlach) Poey. Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 53, pl. 8, figs. 16–19 [not 5–8].

Description. Shell reaching about 8 mm in width, 5.5 mm in height, depressed-globose, smooth, fragile, moderately lustrous. Whorls almost 6, rounded, rapidly increasing in width. Body whorl about $1\frac{1}{2}$ times width of penultimate, subcarinate but becoming more rounded near aperture, not descending at aperture; base moderately inflated. Color light yellow or orange yellow underneath periostracum, basal callus and lip white. Aperture oblique, semilunate, well rounded peripherally, not flattened or depressed above. Palatal lip thin, narrowly expanded, except at both terminations, not extended above, not curved at upper insertion. Basal callus white, glossy, surface roughened by minute granules arranged in wrinklelike formations, very indistinctly delimited parietally by a shallow, curved groove in umbilical region. Columellar edge of callus merging into short, white, rounded, somewhat thickened, upward directed, substyloid denticle with short, somewhat irregularly, slightly curved channel submedially situated near its outer margin. Columella weakly sigmoid, shallowly and irregularly concave below, with low ridge connecting it to basal denticle. Suture well impressed, most strongly along body whorl. Sculpture of irregular, curved, diagonal growth lines, crossed by thread-like, shallow, closely spaced, interrupted spiral striae. Axial lineolations inside shell

substance white, wider than their intervals, very slightly sinuous. Protoconch 1.0 whorl, rounded, minutely and densely punctate. Periostracum thin, pilose, deciduous, with minute hairs arranged in reticulate pattern, reflected in shell as spiral striae. Operculum as in genus, calcareous layer pale yellow, finely granulate, chitinous layer very thin, brownish yellow, with darker, very narrow palatal border, extending beyond edge of calcareous layer, particularly at columellar edge; internal wedge-shaped columellar lamellae well developed.

height in mm	width in mm	
5.3	7.8	La Vigía, E of Mora, Oriente
5.2	7.5	La Vigía, E of Mora, Oriente

Remarks. This is a poorly known and rarely collected species. Poey did not illustrate it and the only previously published figures are the ones in Wagner (1907) which have an unnatural appearance and are misleading in the nature of the basal callus. It was not mentioned by Reeve (1874), and Sowerby (1866), referring to it as *goniostoma* [*sic*], was unable to identify it. Although the shells we examined came from Oriente Province, whereas Poey's type-locality is in Las Villas, they agree well with the original description. This extension of the range should be verified by more collecting.

Poey compared *gonostoma* with *nitida* Pfeiffer and *dissimulans* Poey, but it is closer to *velutina* Poey and may well be the eastern cognate of that western species. It differs from *velutina* in the stronger basal tooth, the wider and shallower labial sinus, and in the fact that the channel near the umbilical margin of the basal callus is much less strongly developed. Moreover, the tooth of *velutina* is directed forward, whereas in *gonostoma* it stands straight up. Finally, the periostracum of *gonostoma* is less dense and generally covers the entire shell.

Poey gives Gundlach's notes on the color of the animal as follows: "Animal brownish,

the surface rugosities somewhat darker gray. Brow and neck (as well as head) blackish; tentacles black with a somewhat lighter distal end." (translated).

Specimens examined. ORIENTE. La Vigía, E of Mora; Piloto del Medio, Sierra de Nipe (IZW).

***Alcadia (Penisoltia) velutina* (Poey)**

Plate 3, figures 4–6; Map 3

Helicina velutina Poey, 1857. *Memorias Historia Natural Isla de Cuba*, 2: 35, pl. 4, figs. 5–7 (not only 6–7) (type-locality [Sierra de] Guane); types (probably in MP). Reeve, 1873, *Conch. Icon.*, vol. 19, *Helicina*, pl. 3, fig. 16. Sowerby, 1866, *Thes. Conchyl.*, 3: 279, pl. 1 (266), fig. 32. Crosse, 1890, *Jour. de Conchyl.*, 38: 324.

Alcadia velutina Poey. Pfeiffer, 1858, *Malak. Blät.*, 5: 5; 1858, *Monographia Pneumonoporum Viventium*, suppl. 1, p. 223. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 56.

Alcadia (Eualcadia) velutina Poey. Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 54, pl. 8, figs. 1–3.

Description. Shell reaching about 10 mm in width, 7 mm in height, depressed-globose, weakly lustrous under pilose periostracum, fragile, subcarinate. Whorls about 5, almost flat, slowly increasing in width. Body whorl about twice the width of penultimate, rounded carinate, descending slowly at aperture; base moderately flattened. Color varied: pale reddish brown, dirty white or gray, lip and band in umbilical area white. Aperture roundly triangular, flattened below, moderately depressed above. Palatal lip thin, expanded, widest centrally, less so at both terminations, sigmoid above and with a narrow, long, U-shaped sinus before the basal tubercle. Basal callus lustrous, unevenly and microscopically granulate, lighter than rest of shell, weakly delimited parietally, and set off by a deep, curved groove umbilically. Umbilical margin of callus with gradually thickening lamella, terminating in strong, rounded, outward directed, sub-styloid tubercle; inner margin of tubercle with rounded, raised lamella; outer margin with shallow groove. Columella lightly sigmoid above, strongly curved and di-

rected outward below and terminating in basal tubercle. Suture well impressed. Sculpture of strong, irregular, slightly curved growth lines. Protoconch $1\frac{1}{2}$ whorls, glassy, lustrous, rounded, minutely and regularly punctate, slightly raised above succeeding whorls. Periostracum thick, deciduous, pilose, almost scaly at outer callus margin, arranged in closely set, narrow spiral bands; bands occasionally gathered in more regular and wider spiral structures. Operculum as in genus, calcareous layer very thin, granulate, slightly thickened and yellowish near columellar margin; chitinous layer bright reddish brown, somewhat darker at outer margin; wedge-shaped internal lamella well developed.

height in mm	width in mm	
6.8	10.5	Sierra de Guane
6.4	9.7	Sierra de Guane
5.3	7.8	Cueva el Catre, Paso Real

Remarks. The shells of this species can be readily recognized by their large size, strongly depressed outline, and thick, occasionally banded periostracum. The long basal sinus and the strong, forwardly directed basal tooth are also characteristic.

According to Arango (1879: 56), *A. velutina* lives on rocks. It has been reported only from the area of Guane in western Cuba where the Sierra de Guane and Sierra Paso Real are its only habitats. This restricted range can probably be explained by the habit of living only on rocks and not in leaf mould. It is larger and more depressed than *dissimulans*, has a thicker periostracum and noticeably more strongly developed basal sinus and tubercle. This last feature also serves to distinguish it most easily from the somewhat similar *nitida* and *rotunda*.

Sowerby (1866) did not succeed in distinguishing *velutina* (pl. 1, fig. 32) from *dissimulans* (pl. 1, fig. 28) since in his drawings the basal sinus of both species is practically alike.

Specimens examined. PINAR DEL RÍO. Pedrera de Mendoza; Cueva el Catre, Sierra Paso Real; Sierra de Guane; W part of Sierra de Guane.

***Alcadia (Penisoltia) minima* (Orbigny)**
Plate 1, figures 1–6; Plate 5, figures 7–9; Plate 6, figures 10–15; Map 1

- Helicina minima* Orbigny, 1842. Mollusques, in Sagra, *Histoire Physique, Politique, et Naturelle de l'Île de Cuba*, 1: 253, pl. 21, figs. 7–9 (“interieur de l'Île de Cuba”; type-locality, here restricted, Peña Blanca, Sierra Anafe, Habana; type BMNH. Sowerby, 1842, *Thes. Conchyl.*, 1: 5, pl. 3, fig. 119; 1866, *Thes. Conchyl.*, 3: 279, pl. 2 (267), figs. 37–38. Pfeiffer, 1850, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 1, p. 30, pl. 3, figs. 23–25.
- Alcadia minima* (Orbigny). Pfeiffer, 1852, *Monographia Pneumonoporum Viventium*, p. 412; 1856, *Malak. Blät.*, 3: 150. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 57. Crosse, 1890, *Jour. de Conchyl.*, 38: 326.
- Alcadia gundlachi* Pfeiffer, 1854. *Malak. Blät.*, 1: 110 (Cuba, type-locality, here restricted, Cabo Cruz, Oriente; type destroyed); 1856, *Malak. Blät.*, 3: 150; 1858, *Monographia Pneumonoporum Viventium*, Suppl. 1, p. 224. Sowerby, 1866, *Thes. Conchyl.*, 3: 286, pl. 1 (271), figs. 211–212. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 57. Crosse, 1890, *Jour. de Conchyl.*, 38: 325.
- Alcadia capax* ‘Gundlach’ Pfeiffer, 1857. *Malak. Blät.*, 4: 113 (Magua and Letran; type-locality, here restricted, Magua near Trinidad, Las Villas; type destroyed; specimen here figured, pl. 6, figs. 10–12, MCZ 90050, T. Bland Collection); 1858, *Monographia Pneumonoporum Viventium*, Suppl. 1, p. 224. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 57.
- Helicina proxima* ‘Gundlach’ Poey, 1858. *Memorias Historia Natural Isla de Cuba*, 2: 6 [*nomen nudum*]. Pfeiffer, 1858, *Malak. Blät.*, 5: 49 (type-locality, Buenavista, Oriente; type destroyed).
- Helicina montana* ‘Wright’ Pfeiffer, 1864. *Malak. Blät.*, 11: 160 (type-locality, Luis Lazo, Pinar del Río; type destroyed; specimen here figured, pl. 6, figs. 13–15, MCZ 90055, T. Bland Collection ex Poey); 1865, *Monographia Pneumonoporum Viventium*, Suppl. 2, p. 220. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 46. Crosse, 1890, *Jour. de Conchyl.*, 38: 312.
- Alcadia proxima* (Pfeiffer). Pfeiffer, 1865, *Monographia Pneumonoporum Viventium*, Suppl. 2, p. 250. Arango, 1879, *Contribución Fauna Malacológica Cubana*, p. 57. Crosse, 1890, *Jour. de Conchyl.*, 38: 326.
- Alcadia (Eualcadia) minima* (Orbigny). Wagner,

- 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, (2) 1: sect. 18, pt. 2, p. 57, pl. 8, figs. 20–23.
- Alcadia (Leialcadia) gundlachi* (Pfeiffer). Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, 2 (1): sect. 18, pt. 2, p. 73, pl. 11, figs. 22–25 (San Juan de los Pinos).
- Alcadia (Eualcadia) proxima* (Pfeiffer). Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, 2 (1): sect. 18, pt. 2, p. 58, p. 9, figs. 4–8.
- Alcadia (Leialcadia) rotunda montana* (Pfeiffer). Wagner, 1907, in Martini and Chemnitz, *Conchyl.-Cab.*, 2 (1): sect. 18, pt. 2, p. 70, pl. 11, figs. 19, 21.
- Alcadia (Alcadia) minima* (Orbigny). Farfante, 1942, *Mem. Soc. Cubana Hist. Nat.*, 16: 50.
- Alcadia quinonesi* Clench and Aguayo, 1950. *Rev. Soc. Malac.*, ‘Carlos de la Torre,’ 7: 63, pl. 12, figs. 9–11 (type-locality, Los Tambores, between Playa Puerto Rico and Punta de Mulas, Banes, Oriente, Cuba; holotype MP 12913; paratype MCZ 185800).
- Alcadia balcata* Aguayo and Juame, 1954. *Rev. Soc. Malac.* ‘Carlos de la Torre,’ 9: 57, pl. 6, figs. 4–6 (type-locality, “Ballenato Grande,” Bahía de Nuevitas, Camagüey; holotype in MP).

Description. Shell reaching about 5.5 mm in width, 4.5 mm in height, depressed-globose, fragile, weakly lustrous under periostracum. Whorls almost 6, slightly convex, slowly increasing in width. Body whorl slightly wider than penultimate, well rounded, descending slightly at aperture; base inflated. Color gray or pale brownish white, occasionally pale reddish, lip and area of basal callus white. Aperture slightly oblique, semilunate, irregularly rounded peripherally, flattened at both terminations. Palatal lip thin, very narrowly expanded except near both terminations, slightly sigmoid above, not curved at upper insertion, with a shallow, widely U-shaped basal sinus. Basal callus white, strongly granulate, raised and well delimited parietally, with a rather strong, curved lamella in the umbilical margin, widening and growing stronger rapidly and terminating distally in a strong, rounded, upward directed tooth which does not project above the height of the basal lip. Columella weakly sigmoid, shortly rounded below and connected to the basal tooth by a low, narrow ridge. Suture moderately impressed. Sculpture of well-defined, irregular, diagonal growth lines only. Axial lineolations

inside shell substance rather wide, narrowly separated, weakly sinuous. Periostracum thin, pilose or hirsute with very short hairs, deciduous, light brown. Operculum as in genus, internal chitinous layer light yellow, reddish brown at palatal margin; outer calcareous layer thin, white, finely granulate; inner wedge-shaped lamellae at columellar edge well developed.

height in mm	width in mm	
4.4	5.5	Silla de Gibara, Oriente
3.8	5.0	Valle San Juan, Guanacabibes, Pinar del Río
3.4	4.7	Coliseo, Matanzas
2.9	4.4	Peña Blanca, Sierra Anafe, Havana

Remarks. This species has been reported from all over Cuba, even appearing in some of the satellite keys and in the westernmost peninsula of Guanacabibes, a flat and barren area. It is strangely absent from the Isle of Pines. On the basis of the material available to us it does not appear to live in the same microhabitats as its closest congener, *hispida*, though both appear to favor the same sort of surroundings, since Arango (1879) reports finding *minima* under rocks and leaf litter (hojarasca), where Gould (1844) also found *hispida*.

Alcaldia minima is characterized by its small size, fragile and rather colorless shell, pilose periostracum, and the very narrow, slightly expanded lip (see also under *hispida*). It is quite uniform in appearance throughout its large range, varying only slightly in size, color, and in the strength of the basal tooth. One lot (MCZ 90050, T. Bland Collection), probably collected in Matanzas by either Pfeiffer or Gundlach, consists of smaller shells, rather more lustrous and somewhat heavier and bluish gray in color.

An examination of large numbers of specimens from numerous localities over the entire island as well as a comparison of the written descriptions and published figures has convinced us that *minima* has been named many times from many parts of

Cuba. All the specimens parading under such names as *gundlachi* Pfeiffer, *capax* Pfeiffer, *montana* Pfeiffer, *quinonesi* Clench and Aguayo, *balteata* Aguayo and Jaume, and probably *proxima* Pfeiffer have the following characteristics in common: 1) the shell is small, generally 5 mm or less in width, fragile and some shade of light brown or dirty white, 2) the periostracum is thinly pilose, 3) the basal sinus is wide, shallow, and U-shaped, 4) the basal denticle is low, narrow, rounded distally, upward and outward directed, and rests at the termination of a low marginal lamella on the basal callus, 5) the operculum is thin and darker at the outer edge. The differences between the "species," real and supposed, are variable or minor. Thus *gundlachi*, *quinonesi*, and *balteata* are said to have spiral color bands, but these bands admittedly do not appear on all the members of the same population. Moreover, color in the Helicinidae must be regarded as an exceedingly variable characteristic. Other cited differences among the synonyms, such as the relative strength of the basal furrow, degree of carination, depth of suture, relative width of the body whorl, are subjective judgments and not consistent in "species" when large numbers of specimens are examined.

It is also important to realize that few of these species were clearly described or well figured, and, in the cases where comparisons with related species were made, no distinction was drawn with *minima*. Thus Clench and Aguayo contrasted their *quinonesi* with *concinna* Pfeiffer because both forms were thought to have color bands. But *concinna* is quite a different species, easily distinguishable from the whole group of *minima*-related taxa. No comparison was made with *minima*, an obviously very closely related—in our opinion identical—species. When *balteata* was described, a contrast was drawn between it and *quinonesi*, again without the mention of *minima*, which should have been the first species to be contrasted. Even then the differences drawn between *quinonesi* and

balteata were relative: spiral sculpture weaker, basal furrow deeper.

The species *quinonesi* was established because of the presence of spiral striae, as in some species of *Emoda*. But an inspection of a good-sized paratype lot (MCZ 185800) showed that many individuals had no sign of such sculpture and were identical with *minima* except for an occasional specimen with light-colored spiral bands.

Pfeiffer wrote that *gundlachi*, of which he had only three specimens, had the denticle "retroflexum." It is difficult to know what he meant, unless he was referring to the fact that the denticle is directed outward when the shell is held vertically with the aperture facing the viewer. But all denticles of *Alcadia* have this feature in common. The only difference in direction we were able to detect is that sometimes denticles are directed upward toward the columella (most species) and sometimes directed forward toward the periphery, as in *velutina* Poey, for example. All denticles are, in addition, directed more or less outwards.

The confusion regarding the identity of these shells is reflected in the erratic naming of series in museum collections. To the investigator, it is soon obvious that the persons responsible for the determinations were not able to fix clear separations for the various taxa and distributed names more or less haphazardly.

The species *minima* is distributed all over Cuba and variations appear both in individuals and in populations. But these variations are not persistent or consistent enough to justify taxonomic recognition, even of a subspecific nature.

Pfeiffer (1856: 150) transcribed Gundlach's notes on the animal which we translate as follows: "Animal pale, with gray spots spread over the entire body, especially underneath the eyes. Tentacles somewhat gray."

Specimens examined. PINAR DEL RÍO. Cabo San Antonio (USNM); Valle San Juan, Guanacabibes (Guanahacabibes); *Guane*: La Tenería, La Muralla (both US

NM); *ensenada* in Sierra San Carlos, opposite S end of Sierra Los Acostas (MCZ); Cerro de Cabras (USNM); mogote N side of Km 14 between Pinar del Río City and Luis Lazo (MCZ). *Viñales*: Mogote la Mina; Mogote Dinamita; Mogote Cayo San Felipe (all USNM); Cueva de los Santos (MCZ). *San Vicente*: Mogote Ensenada de San Vicente; Costanera de San Vicente; Puerta del Ancón; Cueva del Indio, Mogote Bosque; Mogote Palmarito; Laguna de Piedra; La Chorrera (all USNM); Baños de San Vicente (all MCZ). *Rangel*: El Paco; El Retiro (both MCZ). *San Diego de los Baños*: Mogote Indios; La Güira; Mogote 8; Mogote 9; La Cumbre (all USNM); Mogote la Finca; Tibisi; El Toro, Sierra de Limones; El Mamey, Cayajabos; Peña Blanca, El Cuzco (all MCZ). *HABANA*. El Mudo; Tapaste; Madruga; Sitio Bonilla, Jaruco; Sitio Perdido, Jaruco; mountains near Jamaica; Loma de Camoa; Sierra Anafe, S slope (all USNM); Peña Blanca, Sierra Anafe (MCZ). *MATANZAS*. Fundador; Canímar River above ferry, Fundador (both USNM); El Palenque (MCZ); Finca El Par, Pan de Palenque; Portuondo, Pan de Palenque; Pan de Matanzas; Punta de Sabanilla; paredones W bank of Río Canímar below Carretera Central; W of pass, Coliseo; S of pass, Coliseo; Loma Odiseo between Coliseo and San Miguel de los Baños; Mogote Caoba, between Coliseo and San Miguel de los Baños; (all USNM); Monte Cristo (MCZ); paredones, 2 km S of Limonar; Varadero; Abra de Figuerola, Yumurí (all USNM); Abra de Yumurí; Granja Escuela, Colon (both MCZ). *LAS VILLAS*. N slope of Sierra Jatibonico; S end of Loma Ramón Martínez; Jumagua near Sagua La Grande (all USNM); Chinchilla, Sagua La Grande; San Miguel, Sagua la Grande; Finca Valdés, Camao, Remedios; La Puntilla, Remedios (all MCZ); SE side of El Palenque near Remedios; Mogote Ramón Martínez. E side of road between Remedios and Zulueta; Mogote Charco, W side of road between Remedios and Zulueta; Loma San Agustín, SE of Central San Agustín (all

USNM); Loma near San Agustín (MCZ). *Vega Alta*: Vereda del Abra (MCZ); Loma Murciélago; 1st mogote at entrance to Las Piedras; 2nd mogote of La Sierra; Mogote Sola; mogote near Loma Chicharrón; Loma La Sinaloa (all USNM). Cayo Lucas, Yaguajay; Finca Cuetoa, Caibarién; La Portuguesa, Soledad (all MCZ); Cienfuegos; La Vigía, Trinidad; Nacimiento del Río, NW of Trinidad (all USNM); Buenos Aires, Trinidad (MCZ). CAMAGÜEY. Punta de San Juan de los Perros (MCZ); Loma de los Perros, 1 km W of Punta Alegre; 3.5 km from N entrance of Paso Tinaja, E side of Cubitas Mts.; on rocks, Sitio Afuera, S end of Paso Escalera, Cubita Mts.; Los Corrales de Cangolones, Cubitas Mts.; El Terreplén, Turiguanó Id. 1 km W of River Mota; La Vigía, Ensenada de Mora (all ANSP); Heliograph Hill, Turiguanó Id. (MCZ). ORIENTE. *Miranda*: hill N of Mercedes Valley; upper Mercedes Valley; Arroyo del Agua (all ANSP); 2 mi. S of Central Ramón; Buena Vista, S of Bayamo, Sierra Maestre; Cayo Duan, Santiago de Cuba; Puerto Portillo; Cabo Cruz (all USNM); Silla de Gibara; Cayo Francés, Palma Soriano; Portales de Camayén; Pico Turquino (all MCZ).

***Glyptalcadia* Boss and Jacobson new subgenus**

Type-species, *Alcaldia (Alcaldia) euglypta* Clench and Aguayo, 1950.

Description. Shell small with the basal tooth and notch of *Alcaldia s.l.* but differing in the variously formed, somewhat strong surface sculpture.

Remarks. Most species of *Alcaldia s.l.* are characterized by the lack of surface sculpture other than generally weak axial growth lines and, very occasionally, weak, punctate spiral striae. The comparatively strong development of surface sculpture in *A. euglypta* and *camagueyana* is remarkable and deserves, in our opinion, super-specific recognition, for which *Glyptalcadia* is suggested. This subgenus is comparable to the helicinine *Glyptemoda* Clench, which has been treated at the generic level by

Clench and Jacobson (1971a) and which consists of strongly sculptured forms differing from the closely related weakly sculptured species of *Emoda*. It is noteworthy that both these groups occur sympatrically in the eastern part of Cuba.

KEY TO THE SPECIES OF *Glyptalcadia*

1. Sculpture of flat, irregularly spaced and shaped tubercles; frequently carinate; distribution limited to central Camagüey Province *camagueyana*
Sculpture of elongate, white, interrupted axial ridges, never carinate; distribution in north-eastern Oriente Province only *euglypta*

Alcaldia (Glyptalcadia) euglypta

Clench and Aguayo

Plate 4, figures 1–3; Map 3

Alcaldia euglypta Clench and Aguayo, 1950. Rev. Soc. Malac. 'Carlos de la Torre,' 7:64, pl. 12, figs. 6–8 (type-locality, Cerro Cariblanco, Holguín, Oriente; holotype, MP 12911; paratypes, MCZ 185797, 185801).

Description. Shell reaching about $5\frac{1}{2}$ mm in width, $3\frac{1}{2}$ mm in height, strongly depressed, rather solid, surface roughly sculptured, lusterless. Whorls 4 to 5, barely convex, increasing regularly in width. Body whorl about $2\frac{1}{2}$ times wider than penultimate, more rounded below with a weak but distinct, narrowly rounded carina near shoulder, descending briefly but strongly at aperture. Color dirty brown or buff, with irregular, elongate, white, interrupted axial ridges under thin, darker brown hirsute periostracum. Aperture oblique, widely semilunate, well rounded peripherally, somewhat flattened below, weakly extended above and slightly curved at insertion into body whorl. Palatal lip thin, expanded weakly except at both terminations and with shallow, rounded, wide notch before basal tubercle. Basal callus indistinctly delimited parietally, sunken at umbilical area and set off by raised base of body whorl. Curved, slowly strengthening lamella along inner margin of body whorl terminating in low, upward directed, rounded and somewhat thickened tubercle. Columella sigmoid, irregularly concave below, connected

to basal tubercle by low, narrow, rounded, concave ridge. Suture well impressed, strongest near aperture. Sculpture somewhat strong, consisting of numerous narrow, diagonal axial cords, which cover rather high, lighter colored, unevenly wide axial ridges; intervals between ridges about as wide as ridges themselves. Spiral sculpture consisting of few, irregularly and rather widely spaced, occasionally interrupted cords. Sculpture weakening on the base with axial ridges growing noticeably narrower and becoming shallowly and irregularly sinuous. Protoconch $1\frac{1}{2}$ whorls, glossy, rounded, surface much roughened, closely and unevenly granulate. Periostracum hirsute, hairs long, pointed and sparsely set, more closely juxtaposed in intervals between spiral ridges. Operculum as in genus, light reddish brown near the outer margin, paler near inner margin.

height in mm	width in mm	
3.2	5.1	Loma la Vigía, Gibara
2.8	4.5	Loma la Vigía, Gibara
2.6	4.4	Cerro Cariblanco, Holguín

Remarks. Our description is based upon three paratypes. We were unable to detect the colors mentioned in the original description, although one of the specimens examined was collected alive.

This species has a very distinctive shell, which can easily be recognized by its relatively strongly sculptured surface. The white, high axial ridges can be seen at the periphery with the naked eye. Its depressed shape and sculpture will immediately separate it from other species of *Alcadia* of similar size.

This species has been reported only from around Gibara and Holguín, two areas on the northwest coast of Oriente Province about 35 kilometers apart. Although no ecological details were given, it appears to be, like most *Alcadia*, a ground dweller, probably found in leaf mulch and under rocks.

Specimens examined. ORIENTE. Cerro Cariblanco, Holguín; Loma la Vigía, Gibara.

Alcadia (Glyptalcadia) camagueyana
Aguayo and Jaume
Plate 4, figures 4–6; Map 3

Alcadia (Penisoltia) camagueyana Aguayo and Jaume, 1957. *Mem. Soc. Cubana Hist. Nat.*, 23: 122, pl. 1, fig. 9 (type-locality, La Caridad de Mendoza, Minas, Camagüey; holotype, MP 13264; paratypes, MCZ 128771).

Alcadia (Penisoltia) camagueyana porosa Aguayo and Jaume, 1957. *Ibid.*, p. 123, pl. 1, fig. 7 (type-locality, "Los Cangilones," Sierra de Cubitas, Camagüey; holotype, MP 13266).

Alcadia (Penisoltia) camagueyana ecarinata Aguayo and Jaume, 1957. *Ibid.*, p. 124, pl. 1, figs. 11–12 (type-locality, Sierra de Najaza, Camagüey; holotype, MP 13268; paratype, MCZ 47840).

Description. Shell reaching about 6 mm in width, 4 mm in height, depressed, carinate, weakly lustrous, opaque, solid. Whorls $5\frac{1}{2}$, flat, strongly keeled, rapidly increasing in width. Body whorl $1\frac{1}{2}$ times width of penultimate, rounded below, generally with a white, tuberculate keel at shoulder (obsolescent in some specimens) and descending sharply at aperture. Color light chocolate-brown with numerous irregularly formed, opaque, milk-white, irregularly spaced patches, occasionally arranged in spiral bands on the base. Aperture oblique, semilunate, irregularly rounded peripherally, with obtuse angle above and below center. Palatal lip slightly thickened, well expanded, less so at both terminations, narrowly projected above, inserting straight into body whorl; basal sinus exceedingly shallow, wide. Basal callus white, minutely punctate, indistinctly delimited parietally, sunken at umbilical area where set off by subperpendicular, rather high wall of base of body whorl. Upward directed, low, narrow, rounded tooth rising from low, curved lamella on umbilical margin of raised base of body whorl. Columella sigmoid, rounded below and connected to tooth described above by low,

rounded ridge. Suture well impressed, sometimes margined by unevenly raised ridge composed of uneven white tubercles. Sculpture rather strong, consisting of variously well-marked, raised, uneven spiral ridges, composed of irregular flat tubercles and crossed by variously strong, diagonal, curved axial cords; sculpture generally weaker on base. Lineolations within shell substance wider than their intervals, slightly sinuous, most noticeable on white portions of the shell. Protoconch $1\frac{1}{2}$ whorls, glassy, rounded, minutely and unevenly punctate, little raised above succeeding whorls. Periostracum usually wanting but occasionally with long filiform hairs. Operculum as in genus, amber colored, transparent.

height in mm	width in mm	
3.9	5.8	El Cacaotal, Najaza
3.2	5.4	La Caridad de Mendoza, Minas
3.4	6.1	Paso de la Tinaja, Cubitas
3.4	5.5	La Caridad de Mendoza, Minas
3.4	5.4	Cangilones, Cubitas Mts.

Remarks. The shell of this species is distinctive because of its depressed outline, the unique and rather strong sculpture, and the carina, which is visible to the naked eye and is formed of white tubercles. Even when the carina is obsolescent, as in the specimens which were described as *ecarinata* by Aguayo and Jaume (1957), the species is readily recognized by the strong sculpture.

Closely related to the consubgeneric *A. euglypta* Clench and Aguayo from the neighboring Oriente Province, *A. camagueyana* may be differentiated by its surface sculpture, which consists of flat, irregularly spaced and irregularly shaped tubercles. Additionally, a carina is frequently present in *A. camagueyana* and the species lacks the numerous axial cords found in *A. euglypta*.

The species, which is highly variable in its shell features, is found only in Camaguey Province where it occurs in mountain

ranges of both Cubitas and Najaza as well as in some intervening hilly areas. No consistent or marked differences between samples from Najaza or Cubitas were detectable. Further, in a single large series of specimens from La Caridad de Mendoza, we found many specimens which correspond to the descriptions of *porosa* and *ecarinata*, described by Aguayo and Jaume (1957) from Sierra Cubitas and Sierra Najaza, respectively. This overlap in conchological characters and the lack of geographic isolation indicate that there are no recognizable subspecies of *A. camagueyana*.

Apparently *A. camagueyana* must occur in large numbers and must be comparatively easily collected, since some lots at our disposal were extensive. Like several other species of *Alcaldia*, it is probably a ground-dwelling species, found under leaves and on rocks.

Specimens examined. CAMAGÜEY. *Cubitas Mts.*: S of Vereda de los Burros; Los Cangilones; Los Corrales de Cangilones (USNM); La Caridad de Cangilones (USNM); Bainoa, Banoa; Sitio Afuera, S end of Paso Escalera, on rocks (USNM); Finca Pico, north entrance to Paso Escalera (USNM); first descent S of north entrance to Paso Escalera (USNM); E side of the ensenada, Paso Paredones (USNM); 1 km N of south entrance to Paso Paredones (USNM); Paso Paredones; W side of Paso Guanaja, 1 km N of south entrance (USNM); E side of Vereda del Burro, 1.5 km N of Finca "San Clemente" (USNM); N side of Cubitas between Paso Guanaja and Paso Paredones (USNM); Paso de la Tinaja; north entrance to Paso Tinaja; Salta de la Tinaja, 1.5 km from north entrance to the pass (USNM); E of Salta de la Tinaja, 1.5 km from north entrance; $2\frac{1}{2}$ km from N entrance of Paso Tinaja (USNM); E side near south entrance to Paso Tinaja, 1 km from Bainao. El Cacaotal, Najaza; Arroyo Hondo; Loma Santa Cruz, Minas; Guaicanamar near Najaza; La Caridad de Mendoza, Minas; El Zanjón.

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Plate 1

Figs. 1-6. *Alcadia* (*Penisaltia*) *minima* (Orbigny).

Figs. 1-3. MCZ 128742, San Juan de los Perros, Camagüey (height = 4.5 mm).

Figs. 4-6. MCZ 128722, Silla de Gibara, Oriente (height = 4.9 mm).

Figs. 7-9. Topotype of *Alcadia* (*Alcadia*) *nuda bagaensis* Aguayo, MCZ 128775, El Bagá Maisi, Oriente (height = 9.2 mm).

Figs. 10-12. *Alcadia* (*Idesa*) *concinna*, MCZ 86616, ex Gundlach [Cabo Cruz, Oriente] (height = 4.5 mm).

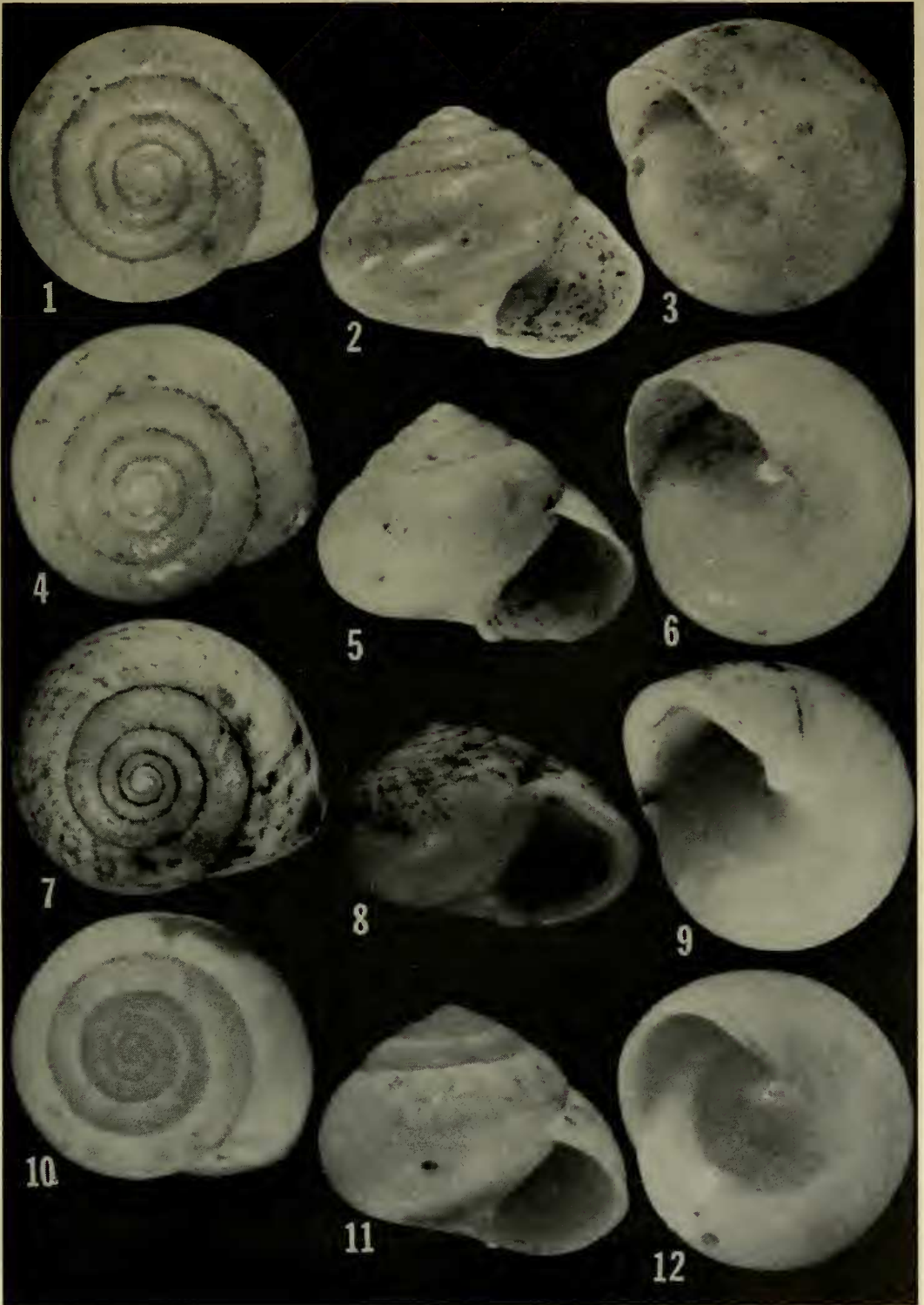


Plate 2

Figs. 1-3. *Alcacia* (*Hjalmarsona*) *neebiana*, MCZ 90056, ex Bland [Cayo del Rey, Mayarí, Oriente] (height = 8.2 mm).

Figs. 4-6. *Alcacia* (*Idesa*) *ratunda* (Orbigny), MCZ 279757, Pan de Azúcar, Pinar del Río (height = 8.0).

Figs. 7-9. *Alcacia* (*Alcacia*) *nuda nuda*, MCZ 90052, ex Bland [Barigua, Baracoa, Oriente] (height = 11.5 mm).

Figs. 10-12. *Alcacia* (*Alcacia*) *incrustata*, MCZ 74028, ex Poey [Yateras, Guantánamo, Oriente] (height = 7.5 mm).

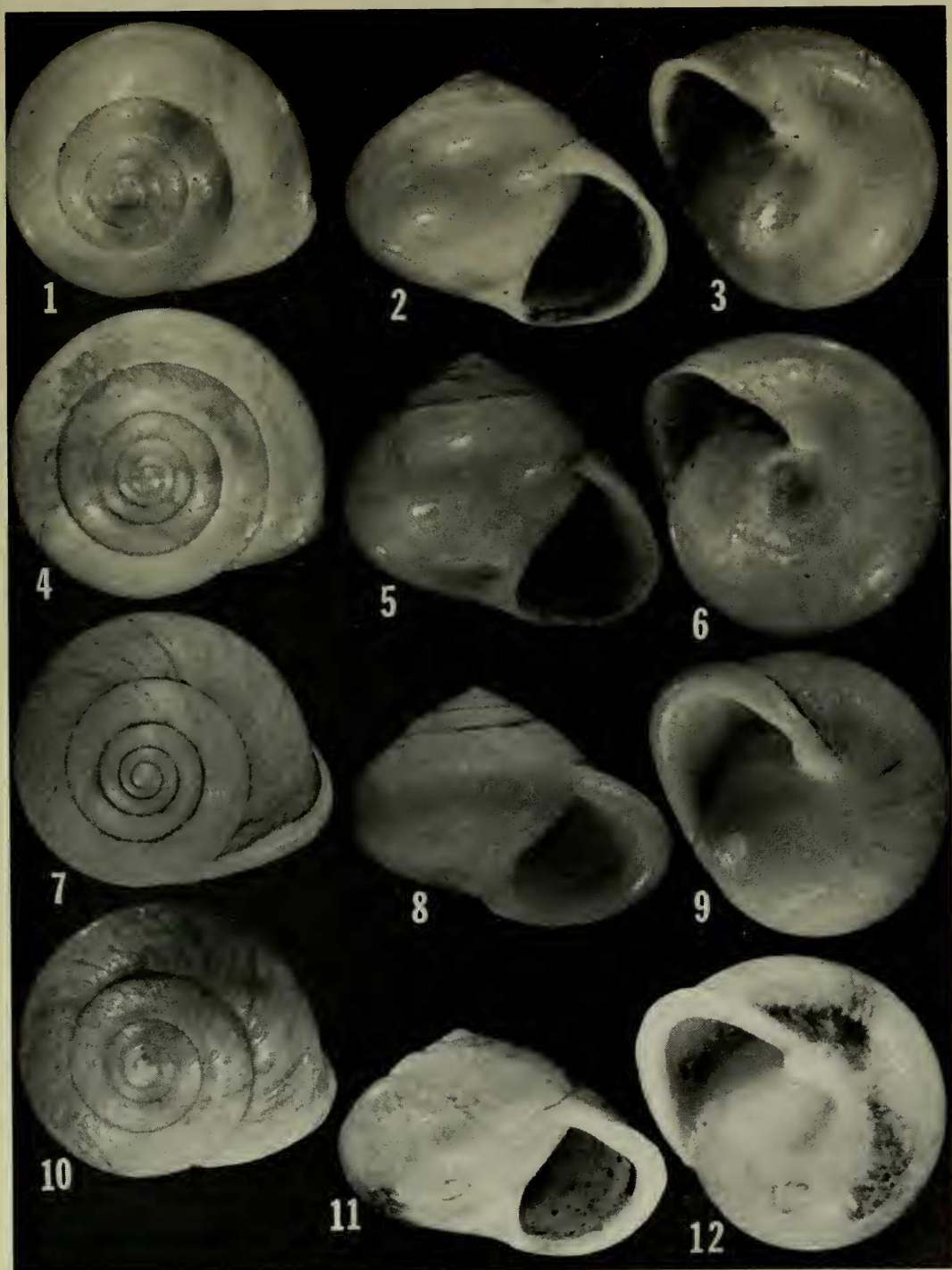


Plate 3

Figs. 1-3. *Alcadia (Idesa) spectabilis* (Pfeiffer), MCZ 74024, ex Anthony [Yateras, Guantánamo, Oriente] (height = 6.5 mm).

Figs. 4-6. Topotype of *Alcadia (Penisaltia) velutina* (Poey), MCZ 128663, Sierra de Guane, Pinar del Río (height = 6.8 mm).

Figs. 7-9. Topotype of *Alcadia (Hjalmarsona) nitida* (Pfeiffer), MCZ 128693, El Descanso, Coliseo, Matanzas (height = 6.8 mm).

Figs. 10-12. *Alcadia (Hjalmarsona) nitida* (Pfeiffer), MCZ 47511, ex Bermudez, Marionoo, Havana (height = 5.1 mm).

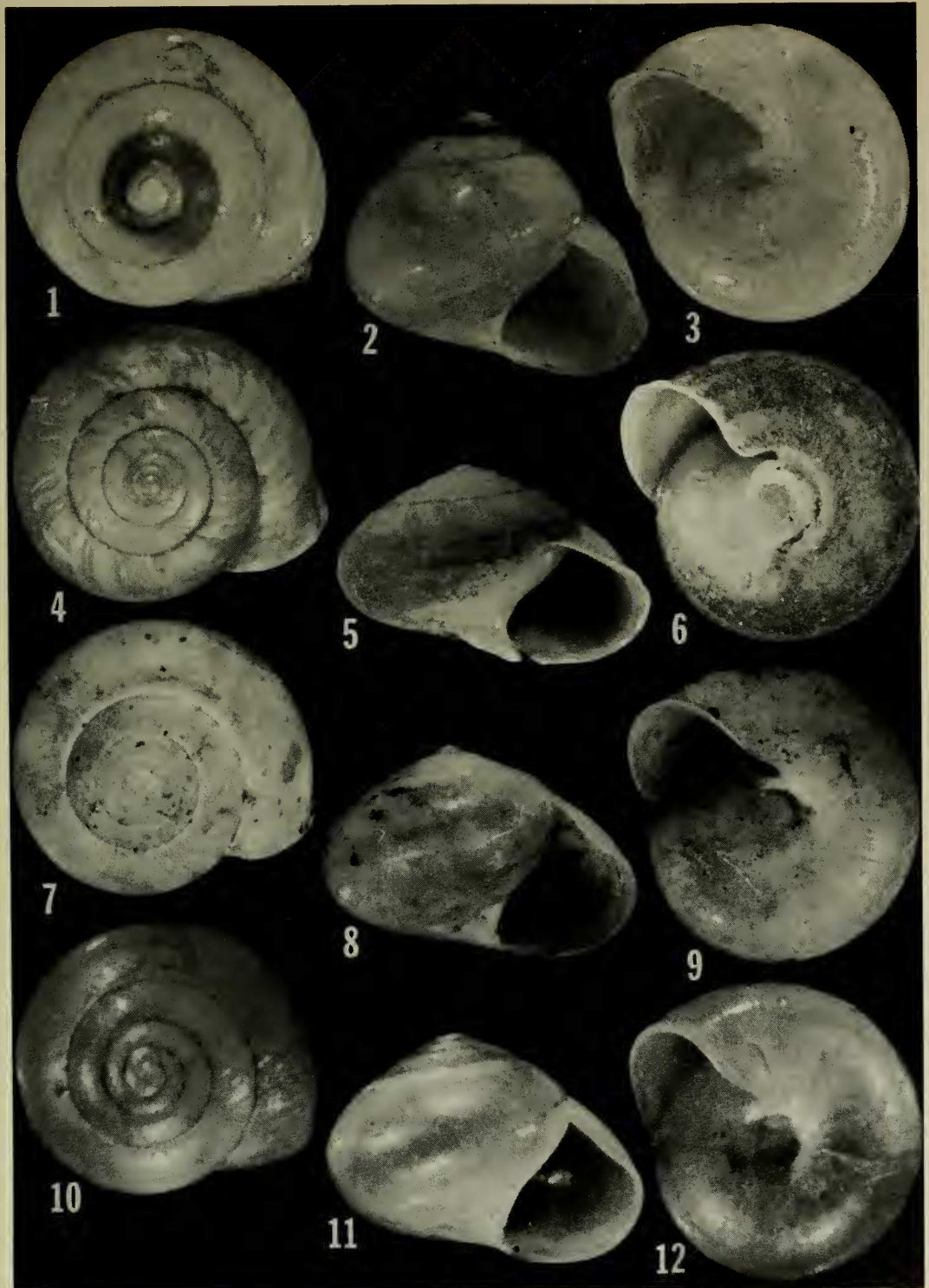


Plate 4

Figs. 1-3. Paratype of *Alcacia euglypta* Clench and Aguayo [= *Alcacia (Glyptalcadia) euglypta*], MCZ 185797, Cerra Cariblanco, Holguín, Oriente (height = 2.6 mm).

Figs. 4-6. Paratype of *Alcacia (Penisoltia) camagueyana* Aguayo and Jaume [= *Alcacia (Glyptalcadia) camagueyana* Aguayo and Jaume], MCZ 128771, La Caridad de Mendoza, Minas, Camagüey (height = 3.4 mm).

Figs. 7-9. *Alcacia (Penisoltia) dissimulans* (Poey), MCZ 98781, Sierra de la Chorrera, San Vicente, Pinar del Río (height = 6.5 mm).

Figs. 10-12. Paratype of *Alcacia bermudezi* Aguayo and Jaume [= *Alcacia (Penisoltia) bermudezi bermudezi* Aguayo and Jaume], MCZ 128665, "La Sierra," Vega Alta, Las Villas (height = 6.4 mm).

Figs. 13-15. *Alcacia (Penisaltia) hispida* (Pfeiffer), MCZ 80849, Managua, Habana (height = 4.4).

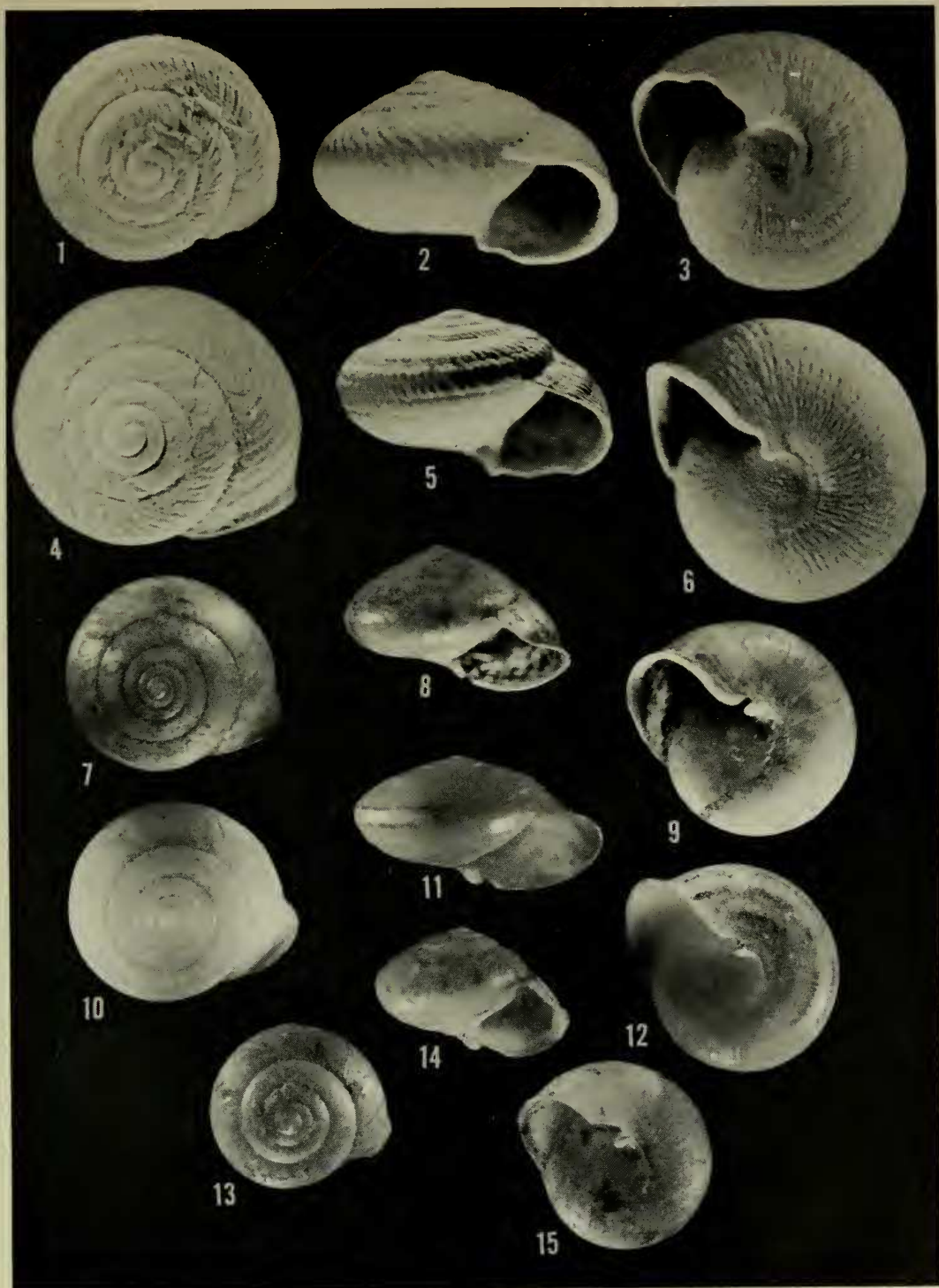


Plate 5

Figs. 1-3. *Alcadia (Penisoltia) gonostoma* (Poey), MCZ 85595, La Vigía, E of Mora, Oriente (height = 5.2 mm).

Figs. 4-6. Holotype of *Alcadia (Penisoltia) bermudezi jatibonica* Boss and Jacobson, new subspecies MCZ 128669, Boquerón de Jatibonico, Las Villas (height = 5.5 mm).

Figs. 7-9. *Alcadia (Penisoltia) minima* (Orbigny), MCZ 128729, Mogote La Finca, San Diego de los Baños, Pinar del Río (height = 4.1 mm).

Figs. 10 and 11. *Alcadia (Idesa) spectabilis* (Pfeiffer), MCZ 277250, S side of Pico Turquino, 1500-3800 ft., Sierra Maestra, Oriente (height = 7.5 mm).

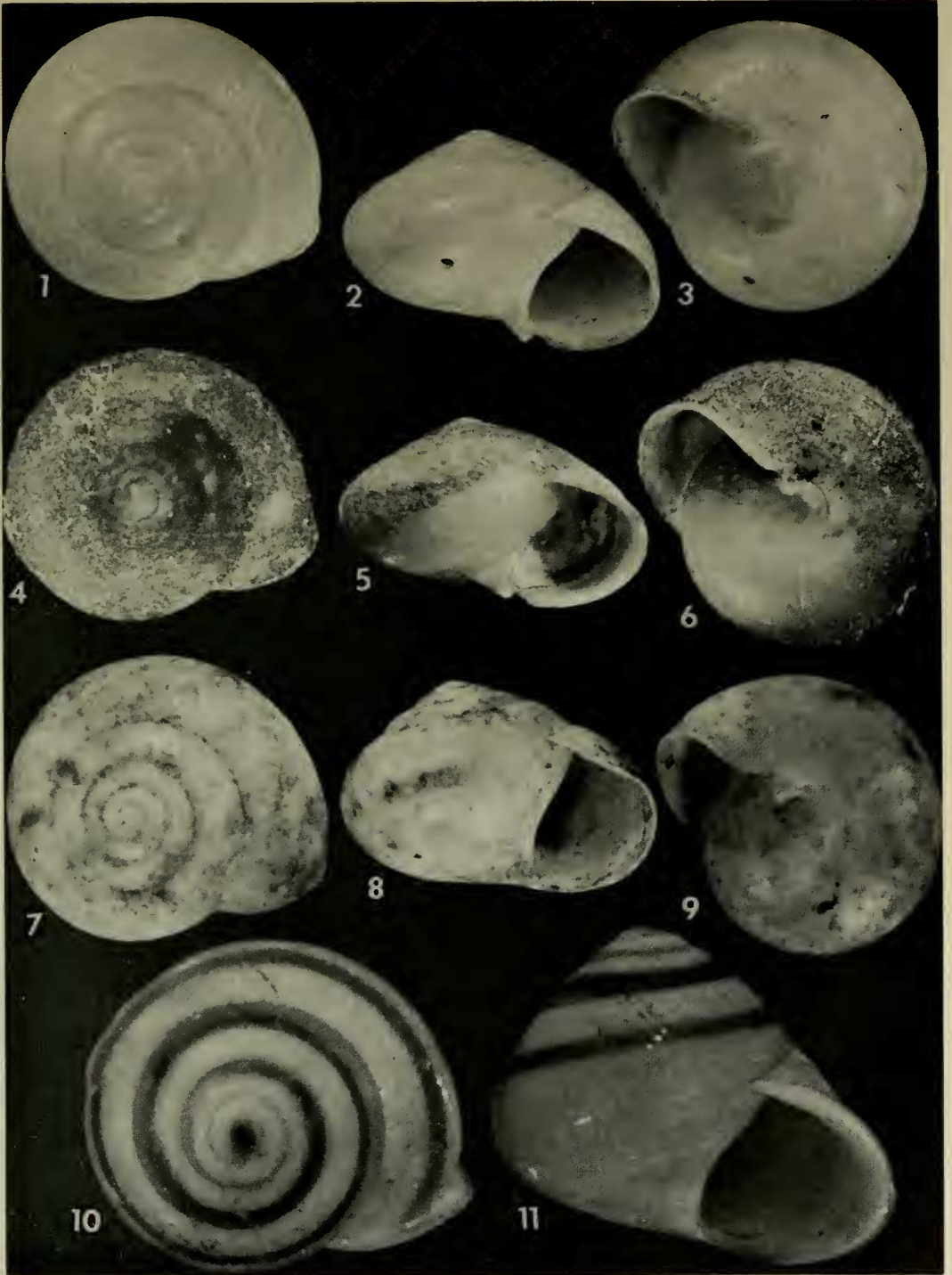


Plate 6

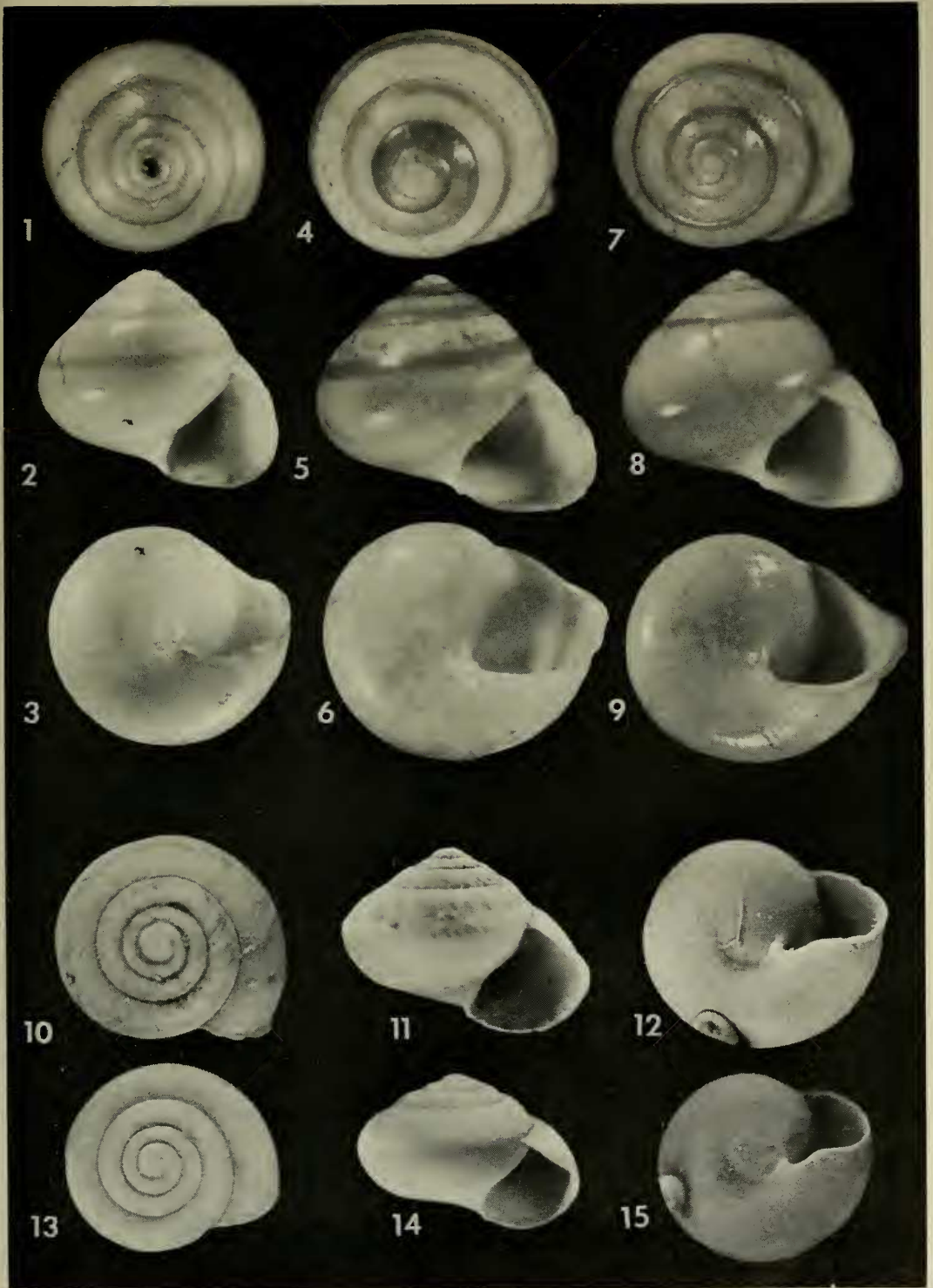
Figs. 1-3. *Alcadia (Idesa) spectabilis*, MCZ 74031, ex Gundlach, Buenavista near Bayamo, Oriente (height = 6.0 mm).

Figs. 4-6. *Alcadia (Idesa) spectabilis*, MCZ 74030, Monte Líbano, Guantánamo, Oriente (height = 6.7 mm).

Figs. 7-9. *Alcadia (Idesa) spectabilis*, MCZ 74029 [La Cubana, Yateras, Guantánamo, Oriente] (height = 6.5 mm).

Figs. 10-12. *Alcadia (Penisoltia) minima*, MCZ 90050, Trinidad, Las Villas (height = 3.3 mm). Specimens sprayed. Ventral view (Fig. 12) with mounting medium.

Figs. 13-15. *Alcadia (Penisoltia) minima*, MCZ 90055 [Luis Lazo, Pinar del Río] (height = 2.5 mm). Specimens sprayed. Ventral view (Fig. 15) with mounting medium.



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